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	Ovens.	Cu. Ft. per Day.
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" " " " " (Leopoldau) . .	72	7,400,000
The Berlin Corporation (Gas Works IV. Danzigerst.) .	40	4,800,000
The Kiel Gas Works	23	2,750,000
The Buda-Pesth Corporation Gas Works	78	9,500,000
The Tokio Gas Company (Omori Works)	36	4,200,000
" " " " (Sunamura Works)	15	1,950,000
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[Communicated.]

Heating the Toledo (O.) Industrial Exposition Hall with Artificial Gas.

[By MR. A. H. GINDELL, Toledo Railways and Light Company.]

The heating of a large area, such as the Toledo Industrial Exposition Hall, which comprises the train shed and first floor of the Terminal Railroad Company's Passenger Depot (see illustration) Cherry

(TOLEDO'S MAGNIFICENT EXPOSITION BUILDING

and Seneca streets, Toledo, O., with artificial gas, has seldom been attempted, for it becomes at once apparent that the cost of installation of such a heating plant for the use of artificial gas would be prohibitive; but in the proposition of heating a building of this kind, where only occasional heat is required, the cost of operation (especially for 1 day or 1 week) did not appear large, since it was considered that the excess cost in using artificial gas would more than balance the cost of a steam plant, on account of the latter plant not being in use most of the time. In the particular case of when heat is required, the plant is put into operation at its maximum, and often at 2 hours notice. No fuel or expense is incurred unless in operation, and the same can be shut down and started without the liability of freezing, as in a steam plant.

So, this system of heating by gas was adopted, after heating plans of various large public buildings of this type and kind were examined in several large cities of the country. The plan of heating (new to Toledo), and comparatively new of origination, will provide ample heat for the building within the least possible time; and, further, will be maintained at no expense whatever when not in use, as ample stove capacity is provided to take care of quick changes in temperature. And, as each unit can be controlled separately, it is possible to operate at a very low cost. No licensed foreman or engineer is required, no coal has to be provided or repair bill to be incurred. Any point or section can be heated as required, without putting the whole system in operation, as with a steam or hot water plant.

The building, an entirely new, modern brick structure with train shed, is 384 feet long by 185 feet wide. The front, designed for office use, is now heated by steam. No provision was made for extra boiler capacity, so, when the building was abandoned for railway purposes, the train shed (330 feet long and 185 feet wide) was inclosed and remodeled for an auditorium, capable of seating in its two sections over 18,000 persons. At last year's automobile show, a temporary steam plant was installed with a complete equipment of radiators; but in very cold weather it proved a failure. Gas was then used to help out, and it gave such good results that this year it was decided to equip the exposition hall with a complete gas heating system.

The plant is now completed at a cost of nearly $1,800. As planned, the twin lobbies, first floor offices and hall, representing 4,500,000 cubic feet of space, are now heated by artificial gas. By the new system 104 gas stoves, with overhead radiating conduits, are placed in position ready for use. The main risers are 2 in number, one located at the rear of building and the other at the front section, and of 4-inch pipe. The running lines are partly 4-inch, reduced to 3-inch, with 2-inch branch lines, reduced 1¼ inches, at certain points. The piping is connected together into a loop, and all dead ends are connected back again into running lines, thereby equalizing the pressure at all points. All stove connections are ¾-inch, reduced ⅝-inch at stove.

The stoves as furnished are of similar design, although two separate concerns bid on the contract—the Toledo Stove and Range Co., and the Charpiot & Mills Co., of Toledo, O., makers of the "Holding" heaters. The styles of heaters adopted are estimated to consume from 22 cubic feet to 35 cubic feet of gas per hour.

Two large service pipes are installed, and meter capacity is provided up to 4,500 cubic feet per hour, with the necessary headers, allowing for extra meters if required. It is estimated that about 3,200 cubic feet of gas per hour will be required for about 6 hours when the building is in use, and about 1,200 cubic feet per hour when unoccupied. The gas is sold on a sliding scale, beginning at 70 cents for first 75,000 cubic feet, gradually being reduced to 55 cents net, for excess of 225,000 cubic feet, or over.

The show opens January 20th and continues to 25th, 1913, and is under the direction of Mr. H. V. Buelow, Manager of the Toledo In-

dustrial Exposition Company, whereupon this installation will be put to a practical test and further data obtained.

The National Bowling Tournament is also to be held in this building (February, 1913), and it is expected by that time any improvements necessary to obtain the best efficiency will be attained, and the installation proved a success.

The New Plant of the Austin (Tex.) Gas Company.

Those conversant with the appearance of the Austin gas plant, as that plant existed 10 years ago, would have some difficulty in discovering any point of resemblance between the plant of 1902 and that of 1912. However, here are a few details respecting the plant of today, which is a modern monument to the skill of the Company's Manager, Mr. H. M. Moore, and to the up-to-date spirit of his Company's owners:

The new plant, which has just been completed, is on the block between Third and Fourth streets, and San Marcos and Medina streets. On this square has been erected a generator house, 54 feet by 50 feet, constructed of steel frame, covered with galvanized corrugated iron, in which are located two 7-foot 6-inch U. G. I. Standard, Double-Superheater Lowe water gas machines. Sufficient area or space remains over which to install a third machine, when necessary. An engine house, 32 feet by 40 feet, constructed of brick, with steel truss roof, covered with galvanized corrugated iron, to house one No. 7 American blower, direct-connected to a 50-horse power Terry steam turbine; one No. 7 Sturtevant blower, belted to a 9x12 Atlas automatic engine: two Root exhausters—one No. 4, the other No. 5; two compressors for high pressure line and two oil pumps. Again, a boiler house, 30 feet by 32 feet, steel frame, with galvanized corrugated iron covering, containing two 66 by 18 Erie tubular boilers. Again, a storage holder up to retaining 200,000 cubic feet capacity, and resting in steel tank; also a 75,000 cubic feet capacity relief holder, in steel tank, and one set of 4 purifying boxes, 10 by 14 by 9 feet. A well constructed works' office, of brick, 20 feet by 30 feet, contains a rotary station meter, street main governor and calori meter. Also, suitable offices for the superintendent. The storage provision provides a concrete, underground, oil tank, with a capacity of 101,000 gallons; a concrete storage house for fuel for generator, 16 feet by 32 feet, having a capacity of about 1,000 tons; a boiler fuel storage house, of concrete, 40 feet by 50 feet, covered with galvanized corrugated iron roof, supported on steel frame.

Engineers who have inspected this plant pronounce it the best equipped and most convenient gas plant in the South, and amongst the best in the country. It has the further advantange of being located on the Houston & Texas Central Railroad tracks, with a siding along the north side, entirely on the Company's property. The Company is also contemplating the laying of several additional miles of main for the betterment of the service. A feature of the distributing system is a high pressure line, about 5 miles in length, ending at the southeast corner of the Insane Asylum grounds, from which gas is discharged into the low pressure mains at seven different places, in order to keep up the pressure to a point where good service can be guaranteed.

For the information herein contained we are largely indebted to the courtesy of Manager Moore.

The Photometry of Incandescent Gas Lamps.

[Prepared for the Seventh Annual Meeting of the American Gas Institute, by Mr. C. O. Bond, Philadelphia, Pa.]

At the last annual meeting of this Institute a paper was promised for presentation at this year's meeting to bear the above title. By contrasting the devices and methods herein described with those which have appeared in the Institute "Proceedings" on the subject of photometry heretofore, a measure is at once had of the change in the attitude towards photometry which we of the gas industry must adopt, if we believe in progress, and hope to keep abreast of our competitors in the spirit of the times. The criterion of the future is to be this:

Entrusted with a pound of coal drawn from the earth's reserve energy, and having, through education and experience, become expert converters of that energy through gaseous form to needful purposes, what is the maximum conversion factor obtainable and the minimum amount of energy necessary in order to safely and agreeably accomplish the desired service of whatever character, we to be fairly compensated for our service. Under the subject of this paper the object is to measure the production of incandescent gaseous illumination from the energy entrusted to us; and to learn the efficiency of production is to put ourselves in a position to apply the new criterion.

This is essential. We cannot know the degree nor direction to advance until we are well informed as to our present position; we need standardization. We need to have some well-defined, uniformly produced, incandescent gas lighting units based on present efficiencies. The present paper describes such apparatus and methods as have come into use in the United Gas Improvement Company's photometrical laboratory in search of this information. It does not claim to have arrived at prefect incandescent gas photometry—that we assume to be the task of the International Photometric Commission.

It is illuminating engineering that has forced the demand for definite comparable information on the available gas units, for on two points of maximum importance are based contracts for lighting and schemes for installation—the photometric curve of light distribution in a vertical plane under standard conditions and the deterioration of the unit under what may be termed normal usage.

As the field of the illuminating engineer embraces not only interior but exterior lighting, the variety of lamps which he must use is numerous, and means for testing all must be available. From the largest, high pressure street lamp to the smallest miniature, low pressure unit, it is desirable that an efficiency factor should be adopted that renders all data furnished readily comparable.

Classification of Lamps.

All lamps can be divided into the two great groups of high and low pressure types. These may be further subdivided into upright and inverted, and indoor and outdoor.

The *true* high pressure lamps are primarily outdoor units of the arc lamp type, being heavily constructed and of high candle power ranges. These use gas under 2 to 3 pounds pressure. In the high pressure group may also be included all lamps of the self-contained or self-intensifying type, which, though supplied at a low main pressure, deliver the gas or mixture to the burner orifice at a considerably higher pressure than that of the supply main. In the same class are lamps operated with air under pressure or with suction on the exhaust. All of the high pressure class make use of some mechanism or physical aid other than plain injection from low main pressures.

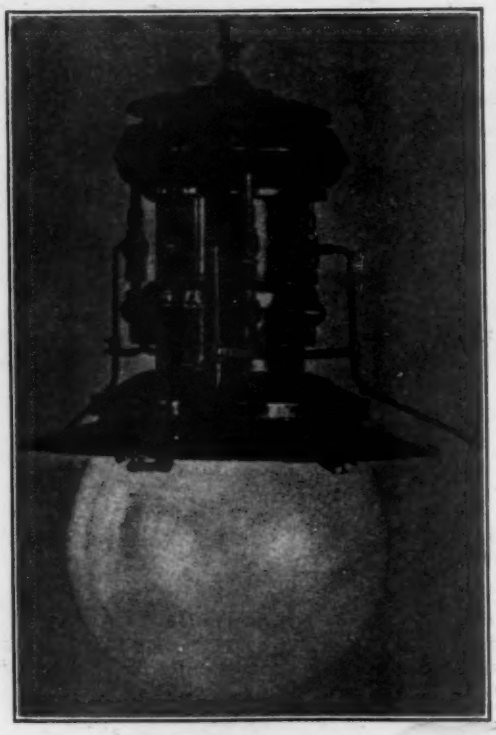

Fig. 1.—High Pressure Arc Lamp. Weight 74 Pounds 8 Ounces

In the low pressure group a much larger variety of types may be found. The further separation into groups is more or less arbitrary.

Lamps have been classified as arcs when they are multiple units, upright or inverted, or a single unit giving over 150 mean spherical candle power; and as small lamps, when between 40 and 75 mean, spherical, candle power inverted, or between 75 and 150 mean, spherical, candle power upright. All below these ratings have been termed "miniature" or "junior" lamps. The illustrations (Figs. 1 to 11)

Fig. 2.—Indoor Arc with Pressure Air. Weight 8 Pounds.

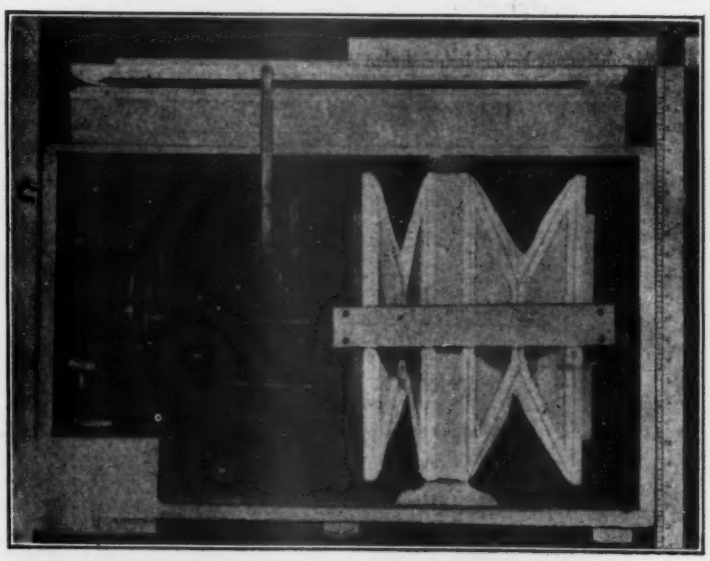

Fig. 3.—Air Pump for Indoor Pressure Air Arc. Weight 38 Pounds 8 Ounces.

show a lamp typical of each class. Indirect and semi-indirect (or direct indirect) fixtures may be classified under specials or arcs. The efficiency of lamps varies with the design and equipment used by the various makers; but while there may not be uniformity of design, size and workmanship among the various makers, we can still hope to have a system of units, graduated according to mean spherical candle power. We are still benefiting through this competitive manufacture and design by steady gain and efficiency, durability appearance, convenience, certainty of operation, and variety of application.

A step in the right direction would be for this Institute to appoint a committee for the purpose of conferring with manufacturers, illuminating engineers and new business managers, with a view to deciding upon, and recommending for adoption by the American Gas Institute, such sized units as they shall deem to the best interests of the gas lighting industry. The lamps at present on the market could then be classified to correspond as closely as may be to the units

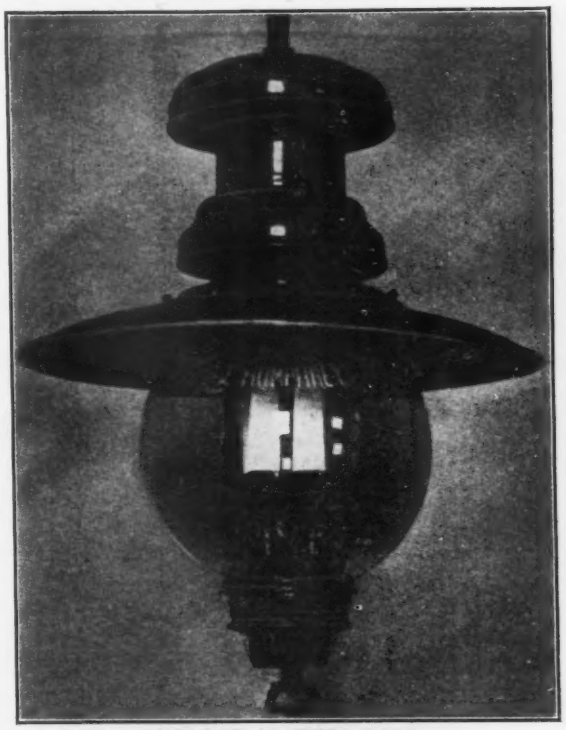

Fig. 4.—Upright Outdoog Arc. Weight 11 Pounds 12 Ounces.

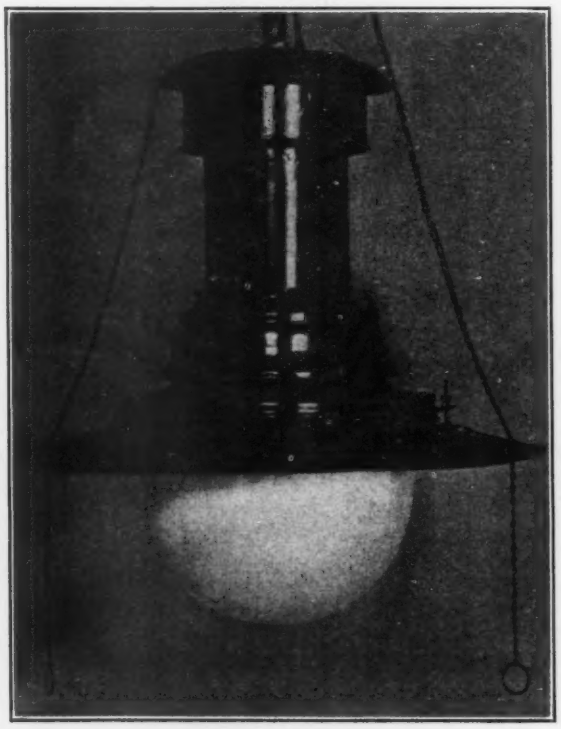

Fig. 5.—Inverted Outdoor Arc. Weight 16 Pounds 6 Ounces.

recommended and future lamps would be capable of such modification during their process of design as to closely conform thereto.

What Constitutes a Practical Lamp Test.

The simplest form of a test for an incandescent gas lamp would be to determine the maximum candle power in any one established direction, together with the accompanying gas consumptions and pressure; and it is this figure which is usually published. Such a test would be of value only where the other quantities to be measured were known to be in a simple proportion to the one given. Unfortunately this is not the case with most of the gas lamps to be examined. The variations in glassware and reflecting inner surfaces of the lamp casings require that the candle power be read through 180°, in order to ensure a proper knowledge of the distribution of the light emitted.

In this laboratory a system of testing has been evolved that includes almost every physical characteristic of the lamp under a wide range of varying conditions. The lamp is first photographed as received,

Fig. 6.—Upright Indoor Arc.

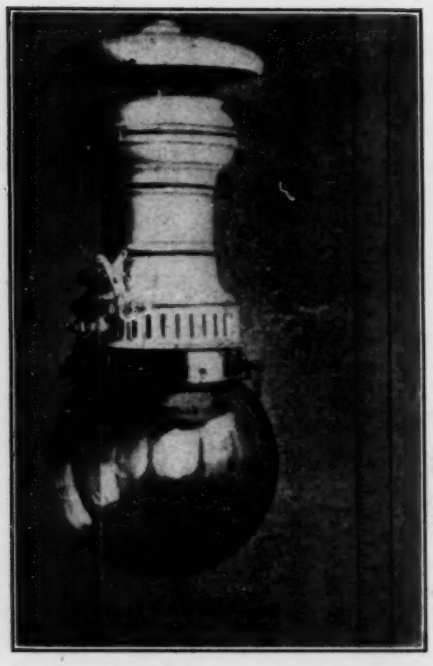

Fig. 7.—Inverted Indoor Arc. Weight 11 Pounds 8 Ounces.

Fig. 8.—Inverted Indoor Unit. Weight 1 Pound 2 Ounces.

Fig. 9.—Inverted Indoor Miniature Unit. Weight 8 Ounces.

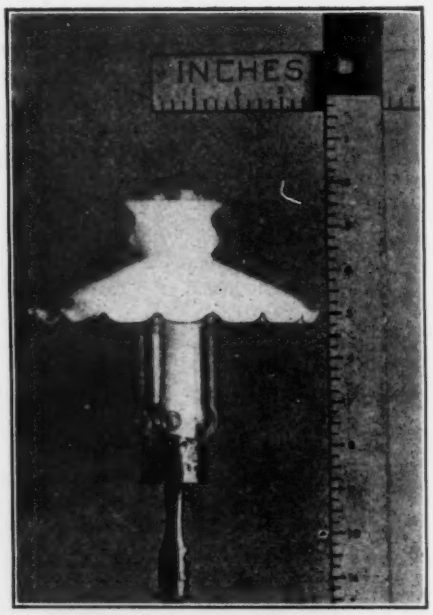

Fig. 10.—Upright Indoor Unit. Weight 8 Ounces.

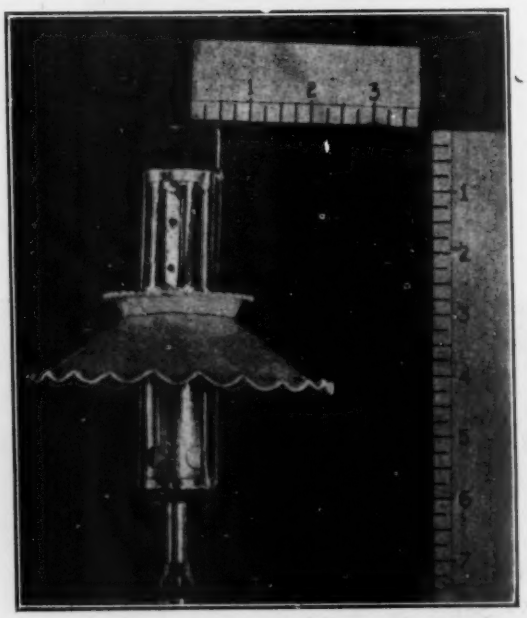

Fig. 11.—Upright Indoor Miniature Unit. Weight 3¼ Ounces.

there being placed in the vertical plane of its center a scale marked in inches, and a display placard showing the date, test number, plate number, tester's initials, name and equipment of lamp and total weight. The beginning of the test consists in determining the distribution of light in a vertical plane with the lamp new and equipped as placed on the market. This is to give fairness to the maker, who at the laboratory may place the lamp himself if he wishes, and make all adjustments. This curve is determined while using a stored gas at a fixed pressure and under conditions as closely uniform as it is possible to obtain. This gas with us is a mixed coal and water gas of about 0.67 specific gravity and 640 B.T.U. The procedure is as follows:

The lamp is first examined for the simplest method of adjustment, of which there are three types: (1) Gas adjustment only; (2) air adjustment only; and (3), both gas and air adjustment. This once determined, the lamp is set in place on the photometer with a swivel-joint and the mantle, supplied with the lamp, is placed and burned off, lighting from the top. The glassware, thoroughly cleaned (and if of several kinds, the most transparent, or, if a clear cylinder, the cylinder only) is then put in place. In order to insure the equilibrium of heat in the lamp, and that all the volatile constituents used in collodionizing the mantle will be burned off, and that the mantle itself shall assume its best shape with regard to the flame of the lamp, the gas is then ignited and the lamp is given a fitter's adjustment to approximate maximum light, and the lamp is burned for ½ hour. After burning this ½ hour the lamp is readjusted, by use of the pho-

tometer, to its best efficiency or the maximum candle power obtainable, with atttendant minimum gas and air supply, the latter adjustment depending upon the style of lamp on test. Once the proper adjustment is obtained the lamp is allowed to burn for about 5 minutes, after which the process of averaging commences. On upright mantles the candle power is taken on 6 equidistant azimuths at the 90° position, and on inverted mantles at 75° position, the nadir position being at 0°. The mean position is then set in the correct plane for photometering. Similar observations made on any en. veloping glassware are taken by revolving it relative to the lamp, determining and setting its mean position likewise. The data for the distribution curves are now determined from an average of several readings taken at each of 20 equi-zonal angles. If the distribution is at all irregular further inter-angular readings are taken. Data on gas quality, consumption, pressure and temperature, and on atmospheric pressure and humidity, together with characteristics of standard lamp and all identifying conditions of test, are noted. An auxiliary test, showing the temperatures at various parts of the lamp, especially those likely to be handled, is then made by means of a thermo-couple pyrometer in series with a millivoltmeter.

The lamp is then moved bodily into a 100-inch integrating sphere and a check test made under quite identical conditions. The second stage of the test then follows. Coal gas is first used and a series of mean spherical candle power readings is obtained on the unit at 1.5 inches, 2.5 inches, 3.5 inches, and 4.5 inches pressure, the lamp being given a fitter's adjustment with minimum attendant consumption at each pressure. The same procedure is followed on carburetted water gas and the previously mentioned standard mixed gas. Also, special note is made of the noise at various pressures on the three gases, the measure being the type of noise, whether a hiss, popping or roar and the maximum distance horizontally at which it can be distinguished in a room ordinarily quiet. On the mixed gas a further procedure is followed. In order to determine the variation in efficiency and in candle power of the lamp through small changes in consumption, gas is supplied at 2.5 inches pressure and several eye adjustments of the lamp are made, so that the consumption varies on both sides of a maximum, mean, spherical candle power, consumptions and candle power data being noted. Curves are plotted, showing both these results and fixing correct consumption. The mantle is then changed for a standard mantle of definite weight and saturation and readings are taken at maximum efficiency. In order to fix a point of departure for the service test the mantle originally supplied is then replaced and the lamp given a final adjustment at 2.5 inches pressure, and its mean, spherical candle power determined. The lamp is then removed and placed for service test on the life rack, indoor or outdoor, as the case may be. The lamp is operated for a maintenance period of 10 days, being lighted on an average of 5 hours per day and extinguished for the remainder of the time. During this period notes are made of the operation and behavior of the lamp, mantle, or globe breakage, popping, flashbacks (especially at ignition), carbonization, whistling or roaring, discoloration and other information and incidents of interest. At the end of the period the lamp is bodily removed and replaced in the integrating sphere and readings again taken. The total deterioration as a light unit is thus measured. The glassware is then removed, cleaned and replaced, and further readings taken with the supplied and with the "standard" mantles. From this data, made under conditions as closely approximating the original as possible, the losses due to dirt accumulated on glassware, dirt accumulated in lamp proper and mantle deterioration can be computed.

In case the lamp as equipped for market shows decided promise and efficiency a further life test is made. The lamp is then replaced on the life test rack, and burned for periods varying from 1,000 to 2,000 hours, and the same procedure followed as above, or with different variations as desired. This test would apply more strictly to small lamps that are cared for entirely by the consumer who would not as a rule disturb the lamp until its candle power was so reduced that the illumination was unsatisfactory.

When the testing of the lamp is finished it is taken apart and a drawing to scale made, giving the dimensions, material, finish and location of all constructional and operating parts, and showing at the points indicated the temperatures of the lamp when burning.

Variables Entering into the Photometric Test.

As the process of lamp testing was developed it was found than an unusual number of variables entered in, with more or less weight, on the results obtained, especially on the distribution of light and the efficiencies. Every curve is made with some definite object in view, the principal ones being the efficiency of the lamp itself with the simplest glassware, or for the distribution of the light from some definite type of glassware. Now, if the efficiency data is to be of any value, especially for inter-comparison with data from other lamps, the conditions under which it is obtained must be similar or the variation due to each must be calculable and corrected for. If the distribution curve only is required, as for the calculation of an installation of similar lamps, the general conditions of operation under test must bear some definite relation to those of the installation had in mind.

The number of conditions that aflect the direct ratio of light given out to energy put in are numerous; but those that, with a given type of lamp body, directly affect the curve shape and efficiency ratio may be reduced to about 12; kind of gas, specific gravity, calorific value, pressure, consumption, atmospheric humidity, thickness and uniformity of glassware, material, mesh, weight, saturation and shape of mantle, all conditions relating directly to the construction of the burner from gas inlet to spent product outlet, with the exception of gas orifice adjustment, being considered as fixed and beyond the operator's control.

(a) *Kind of Gas.*—The usual limit of variation for any one lamp operated on artificial gas is coal gas, carbureted water gas or a mixture of the two. A lamp designed for artificial gas could hardly be expected, without some modification, to operate satisfactorily on natural gas.

(b) *Specific Gravity.*—The effect of sudden changes in specific gravity can be understood, when it is known that the velocity of of flow through the lamp orifice is inversely proportional to the square root of the specific gravity, and that the air entrained is proportional to the kinetic energy in the issuing gas (amV^2).

The following computation will show the specific gravity effect of changing at constant pressure from a 22.8-candle power carbureted water gas to a 15.4-candle power coal gas:

Carbureted Water Gas.

Specific gravity 0.667
Candle power 22.8

1 Cu. Ft. of Gas.	Per Cent.		Air per Cu. Ft. Required.	Cu. Ft. Air.
Ills.	9.8	×	14.36	1.409
CO	29.6	×	2.39	0.707
H_2	35.5	×	2.39	0.848
CH_4	15.2	×	9.57	1.450
C_2H_2	0.5	×	16.75	0.048
				4.498
CO_2	4.0			
O_2	0.6	×	5.0	0.030
				4.468
N_2	4.7			
	100.0			

Coal Gas.

Specific gravity 0.462
Candle power 15.4

1 Cu. Ft of Gas.	Per Cent.		Air per Cu. Ft. Required.	Cu. Ft. Air.
Ills.	4.0	×	14.36	0.574
CO	10.0	×	2.39	0.239
H_2	49.6	×	2.39	1.185
CH_4	30.4	×	9.57	2.910
C_2H_2	0.6	×	16.75	0.101
				5.009
CO_2	1.4			
O_2	1.0	×	5.0	0.050
				4.959
N_2	3.0			
	100.0			

If, then, the volume of primary air entrained is proportional to the kinetic energy of the issuing gas, and knowing that the volume of gas issuing is proportional to its velocity, it can be proved that with constant pressure and using the same orifice, the volume ratio of gas to primary air entrained is independent of the specific gravity of the gas. From the above computation it is seen that the quantity (4.959 cubic feet) of air necessary for the complete combustion of 1 cubic foot of coal gas is different from the quantity of air necessary (4.468 cubic feet) to the complete combustion of 1 cubic foot of the water

gas by the ratio of $\frac{1.11}{1}$. Consequently, when in practice a change is made from water gas to coal gas the primary air entrained shows proportionally less and the tendency is for the lamp to carbonize. Whree the change is made from coal gas to water gas the primary air entrained shows proportionally greater and the tendency is to flashback.

(c) *Calorific Value.*—A pronounced effect noticed with a change of calorific value is the variation in the total flux of light, the candle power, when the lamp is properly adjusted for each gas, rising and falling with the calorific value of the fuel supplied within the range of artificial illuminating gases. A great deal of work has been done, particularly by members of the International Photometric Commission, on this relation of incandescent candle power of gas to the calorific value and the results seem to prove that, under conditions of proper combustion, the total light given out is almost directly in proportion to the amount of energy available.

(d) *Pressure.*—The effect of pressure variation is very like that of specific gravity change. The quantity of gas issuing through a fixed orifice increases with the square root of the pressure, while the air entrained, due to the energy of the escaping gas, is proportional directly to the pressure. Consequently, the tendency is for a lamp to flash back, on increase, and carbonize, on decrease, of pressure. Some lamps, being very sensitive to pressure variation, are liable to carbonize readily, while others are equipped with governing devices that render them practically independent of such minor fluctuations as ordinarily occur in a low pressure distribution system.

(e) *Consumption.*—Improper consumption is generally due to improper adjustment, as on a uniform gas it will not vary. If a lamp is given too much gas without appreciably decreasing the candle power slow carbonization may occur, which will eventually totally carbonize mantle and burner. If too little gas is supplied the lamp may, when cold, flash back on ignition, and in some cases may become almost impossible to ignite for this reason.

(f) *Atmospheric Humidity.*—In the photometry of open flames by the pentane lamp, or by similar open flame standards, the atmospheric conditions effect both so nearly equal that correction for either is unnecessary. With incandescent gas lamps the case differs, and the effect of atmospheric humidity on the candle power and efficiency, though of an appreciable amount, has been almost entirely neglected. Especially is this noticeable where vacuum electric lamps, unaffected by atmospheric changes, are employed as the primary or secondary standard. It seems just, however, in a comparison between results obtained in winter, where the liters of water vapor per cubic meter of dry air may be as low as 2, and in summer, where they may be as high as 32 that some correction should be made. Taking as standard 8 liters, it has been found experimentally, through moisture control in a small metal chamber, that for each liter added to the air the following percentage losses in illuminating value occurred:

	Per Cent.
For an inverted lamp with inner cylinder.....	+ 0.785
For an upright lamp with straight chimney.....	+ 0.597
For an upright lamp with air-hole chimney	+ 0.407

Thus it can be seen that, if these experimental results be borne out in practice over a sufficient range of time and moisture, for a change of 30 liters, a correction for an inverted lamp of 23.55 per cent. would be required.

(g) *Thickness and Uniformity of Glassware.*—Another difficulty that embarrases the comparison of efficiencies lies in the variability of glassware. If all lamps were of a standard size for fitting glassware much trouble could be eliminated; but they are not. The glassware supplied for a lamp may be of any shape and of almost any quality and thickness. An opal globe can hardly be compared with a clear one, unless the absorptive powers be known. In making a curve the varying thickness of a globe may be somewhat corrected for by using the averaging method above described, or by using the sphere test as a check to obtain a correction factor to use on the curve. The ideal method would by a standard sized globe ring and a clear colorless glass of minimum thickness for all efficiency tests.

(h), (i), (j), (k) *Material, Mesh, Weight, Saturation and Shape of Mantles.*—No matter how excellent may be the design, workmanship and operation of an incandescent gas lamp, its chief reason for existence is the mantle it encloses. And as long as the mantle remains intact the average consumer overlooks dirty glassware and low efficiency. This fact has left the door open for the entrance of lamps claiming wonderfully high efficiencies, and making good their claims initially; but the methods of testing had to be enlarged to cover this class of lamps. Gradually there has been formed a method of distinguishing with speed and certainty between the results obtained with a "flash" mantle, which gives a very high candle power for a short time, and a "heavy" mantle that gives a lower candle power, but for a considerably longer time. This quality depends upon the weight, saturation, mesh and material. The lower the saturation the higher the candle power will be. The material may be cotton, ramie or artificial silk fiber, their apparent life and strength increasing in the order shown. These points are mainly covered in a test by determining the weight of mantle ash per unit area after burning an hour and comparing it with an equal area of one arbitrarily chosen as a normal standard. The weave and thickness of fiber have a considerable influence on the weight; but, in comparative tests, the relative weights show fairly well what may be expected in performance. One of the vital requisites of a good mantle is that it should fit the flame. If the flame does not fill the mantle there will be a great loss in illuminating power, while, if the mantle is too small, the flame is chocked and loss of capacity and efficiency will result.

Apparatus Used in Test.

The Five-Meter Radial Photometer.—For the distribution curve work use is made of radial photometers, using the substitution method with electric primary and secondary standards. In Fig. 12 is shown

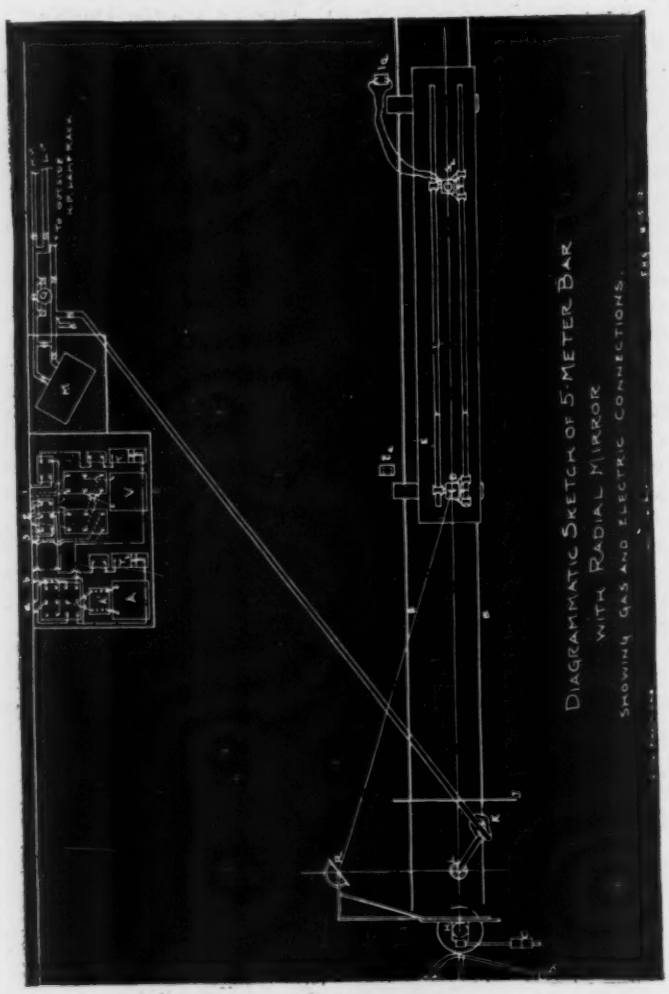

FIG 12.

a diagram of a 5-meter bar with radial mirror and gas and electric connections. The scale on the bar is 5 meters long, and the disk box (*D*) is made fast at the *O* mark on the end near the lamp to be tested. The tracks (*FF*) are on a long table (*E*), that in turn can be placed in any position in the length of the room by moving it on the rails (*BB*). These rails extend to the right into another room, so that the distance from lamp to disk box can be lengthened considerably. The lamp to be tested is hung from the ceiling at (*L*) by an adjustable hanger, so that it can be centered exactly. The gas connection is by a flexible metallic hose (*K*). The rays of light are deflected in the disk box by an adjustable mirror (*R*), which is connected rigidly to a revolving disk (*H*), graduated in degrees and counterbalanced at (*C*). A removable opaque screen (*J*) prevents any of the direct rays entering the disk box. The mirror will take any light source up to 25 inches diameter. The comparison standard is S_s, an electric incan-

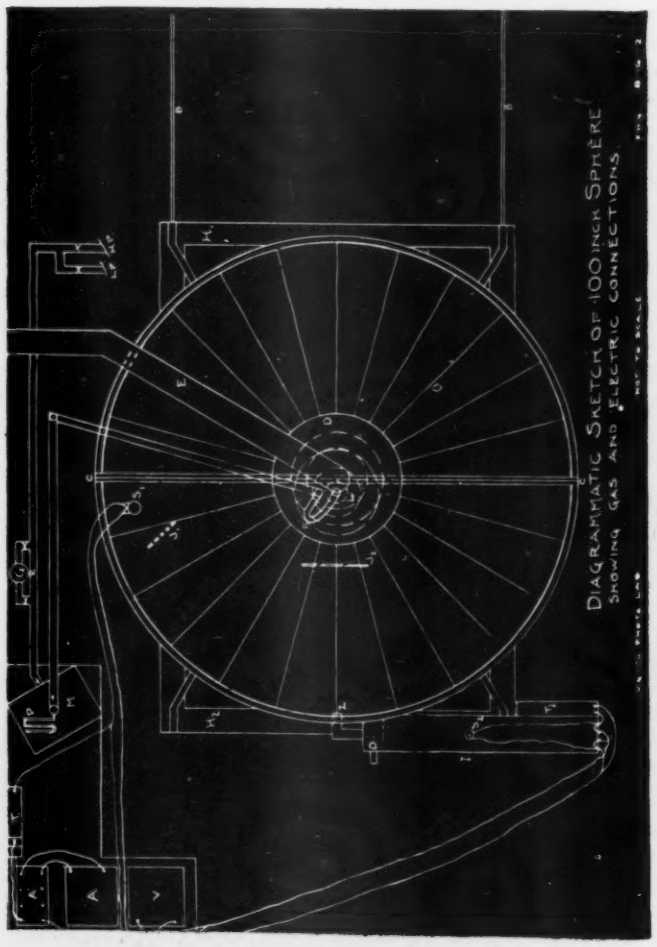

Fig. 13.

PHOTOMETRICAL LABORATORY

QUALITATIVE GAS TEST

SAMPLE Date 3/23/11

Gas Stored Mixed Hour 9.00 A.M. Date 3/23/11 Holder — Cu. Ft. 120

Remarks

CALORIFIC VALUE

Hour 11.15 A.M.

	Inlet (T1)	Outlet (T2)
	78.95	92.80
		92.80
		92.80
		92.80
	78.95	92.85
		92.90
		92.90
		92.90
	78.95	92.90
Total		92850
Avg.	78.95	92.85
Dif. (T2−T1)		13.90

Temp. Room (Tr) 82 F°

" Effluent (Te) 83 F°

Gas Burnt Cu. Ft. (G) .1

Temp. Meter (Tm) 82 F°

Barom. (P) 30.00

Factor for Tm and P (K) .941

Gas Rate Cu. Ft. Per Hr. (R) 7.0

Water Heated—Lbs. (W) 4.40

" Condensed—C. Cs. (C) .004

B. T. U. = $\frac{W \times (T2-T1)}{G \times K}$ 659

SPECIFIC GRAVITY Hour 11.30 A.M.

SECONDS

AIR	GAS
43.9	36.4
43.9	36.4
Average 43.9	36.4 Sp. Gr. .697

CANDLE POWER Hour 11.40 A.M.

Standard Value 32.00

Reg. 1.24

Meter T. 79.7

Temp. 80

Barom. 32.00

C. P. 39.4

GAS ANALYSIS Sampled

Co No	5 Vol.
Co H2n + 2	"
Co H2n	"
C H4	"
C O	"
C O2	"
H2	"
O2	"
N2	"
TOTAL	

By S. F. Kelly

"A"

descent lamp. This standard may be of any candle power, being checked against a "primary," electric carbon standard (S_1), which, prior to the test, is swung into the position to be occupied by the test lamp (L). The meter (M) is of 2 cubic feet per revolution capacity and tested to 5 pounds pressure. Either high or low pressure gas can be used, and in the former case the governor (G) and pressure gauge (P) are by-passed and the pressure regulated at the compressor. The electric connections may be traced from the diagram; (a and b) are two primary circuits supplied by storage batteries of a capacity of 150 volts and 25 amperes. (A) and (A^1) are a Weston ammeter and shunt, and (V) a Weston voltmeter. Each has 3 scales. In case greater accuracy is desired or required a potentiometer is used. (T_1) and (T_2) are variable German silver resistances. The circuits 1, 2 and 3 correspond to the floor plugs, 1a, 2a and 3a. One is supplied from (b), and 2 and 3 from (a). Between (R) and (D), and as close to (D) as possible, is placed a revolving screen consisting of 2 parallel disks having one opening in each disk. These openings are sections of a cone, one end of which is the disk and the base the mirror. By suitable switches the ammeter and voltmeter may be thrown in on either circuit, either together or separately.

Test No. Sheet No.

UNITED GAS IMPROVEMENT COMPANY

PHOTOMETRICAL LABORATORY

LIGHT DISTRIBUTION IN VERTICAL PLANE

MAKE OF LAMP — DATE 3/23/11 HOUR 2.00 P.M.

TYPE Small Sudan Inverted NO. OF BURNERS 10

MANTLE USED Thorium Tube HOURS IN USE 200 Approx.

GLOBE Clear REFLECTOR

GAS Mixed SP. GT. PER M2. 1.38 lbs (1.58) PRESS 24" TEMP. CR

BAROM 30.10 B.T.U. (DRY) 650 C.P. 22.4 SP. GR. .697

GAS USED 3 Weston STANDARD USED 674 VALUE 10.00 LITERS H. 2 6.0

DATE OF TEST Secondary 972 5 C.P. 0.0 772 1913

ANGLE	GAS READING (CU. FT.) RIGHT	GAS READING (CU. FT.) LEFT	CANDLE-POWER (GAS) RIGHT	CANDLE-POWER (GAS) LEFT	CANDLE-POWER (CORR) RIGHT	CANDLE-POWER (CORR) LEFT	MEAN C. P.
90°	—				—		
180°-90°	—						
170°-10°	—				—		
160°-20°	176.0				15.7		
150°-30°	163.0				23.8		
140°-40°	159.5				29.2		
130°-50°	156.5				30.4		
120°-60°	121.6				33.0		
110°-70°	117.2				33.6		
100°-80°	115.5				36.5		
90°-90°	112.8				36.2		
					24.22		
90°	113.3				37.9		
80°-10°	108.1				41.6		
70°-20°	106.0				43.3		
60°-30°	105.2				44.0		
50°-40°	104.0				44.0		
40°-50°	100.5				46.2		
30°-60°	100.2				46.5		
20°-70°	100.0				46.7		
10°-80°	98.8				50.5		
0°-90°	98.5				52.9		
10°-10°	96.8				46.9		
					47.72		
RADIUS 9"	659				659		

M. H. S. CP. 24.22 Lm 152.10 M. S. CANDLES PER CU. FT. 15.63 LUMENS PER B. T. U. 0.151

M. L. H. S. CP. 47.72 Lm 299.66 M. S. CANDLES PER CU. FT. 30.79 " " B. T. U. 0.297

M. S. CP. 35.97 Lm 461.78 M. S. CANDLES PER CU. FT. 23.21 " " B. T. U. 0.446

REMARKS

TEST MADE BY M. S. White

"B"

UNITED GAS IMPROVEMENT COMPANY

Test No. —
Photo No. —
Photo No. —
Section No. —

PHOTOMETRICAL LABORATORY

INTEGRATING SPHERE TEST

Data Sheet No.

MAKE OF LAMP — DATE 4/2/11 - 4/8/11 HOUR A.M.

TYPE Small Sudan Inverted NO. OF BURNERS 1

MANTLE USED Thorium Tube HOURS IN USE 1

GLOBE Clear REFLECTOR —

ILLUMINOMETER USED 960 (16 c.p. gauge) GAS (coal gas) LAMP #1 VOLTAGE 108.8

SPHERE USED 100" STANDARD 3029 9.6 83.6

M. S. C. P. VOLTAGE AMPERES

DATA OF TEST

4/7/11

GAS	Pressure	Cu. Ft. per Hr. (Gas)	Cu. Ft. per Hr. (Corr.)	M. S. C. P.	M. S. C. P. per Cu. Ft.	B. T. U. per Cu. Ft.	Barom.	Temp.
COAL	2.0"	1.86	1.78	20.2	11.3	0.248	29.97	76.4°
B. T. U. 672	2.5"	2.04	1.96	22.0	11.2	0.246	-	-
C. P. 10.8	3.5"	2.68	1.62	25.0	15.4	0.339	-	-
Sp. Gr. .421	4.5"	2.58	1.80	25.2	13.9	0.281		
From H_2O = 16.0		Lamp flames on higher consumption						
4/8/11								
WATER	2.0"	1.66	1.62	12.8	23.1	0.448	30.31	68.0°
B. T. U. 648	2.5"	1.62	1.60	37.4	23.4	0.453	-	-
C. P. 18.4	3.5"	2.06	2.02	33.2	16.4	0.318	-	-
Sp. Gr. .708	4.5"	2.18	2.15	44.2	20.5	0.397	-	-
From H_2O = 11.0		Lamp flame slightly						
4/8/11								
MIXED	2.0"	1.50	1.48	33.0	22.3	0.431	30.31	68.0°
B. T. U. 630	2.5"	1.76	1.78	38.6	22.7	0.440	-	-
C. P. 19.9	3.5"	2.10	2.08	38.0	18.8	0.365	-	-
Sp. Gr. .579	4.5"	2.18	2.05	42.5	20.6	0.385	-	-
From H_2O = 11.0								

4/25/11 5.00 P.M. AFTER LIFE-TEST

MIXED	Before Cleaning Globe							
B. T. U. 648	2.5"	1.77	1.75	33.5	19.5	0.378	30.05	75.0°
C. P. 19.8	After Cleaning Globe							
Sp. Gr. .656	2.5"	1.80	1.78	34.7	19.6	0.384	-	-
From H_2O = 12.8								

REMARKS

	Loss on C.P.	Loss on Efficiency
Coal	8.9%	5.0%
Lamp Alone	8.1%	4.0%

Reader M. S. White Checked by E. F. Kingsbury

"C"

The Integrating Sphere.—The 100 inch sphere and connections are shown in Fig. 13. The sphere proper is made in 2 halves, the dividing line being at (CC). One-half the frame (H_2) is fastened to the floor, while the other half (H_1) runs on a track (BB). The lamp to be tested is hung at (L), with vertical adjustment only. The gas is

(*Continued on page* 426.)

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NEW YORK, MONDAY, DECEMBER 30, 1912.

BRIEFLY TOLD.

DECEMBER MEETING, BRONX GAS AND ELECTRIC COMPANY.—The 11th inst. the Bronx (N.Y.) Gas and Electric Company called together the members of all departments of the Company to find out what the Committee had in store. Notices appeared in the offices and shops saying that the Committee had secured Mr. Alfred B. Cruikshank, the Company's Counsel, and Mr. Sprague, of the General Electric Company, as the evening's speakers, and this mention brought out one of the largest audiences to date. Mr. Cruikshank opened his remarks by saying that his talk would have to do with the law side of a public service corporation. He tried to dispel in all minds the idea that a lawyer was necessarily a very bright or learned man, and very plainly classified the different fields of law practice in which lawyers indulged. An explanation of the formation of corporations was most interesting, showing the difference between such a business organization, with its officers and directors, and a partnership, the usual form of small business. The most interesting phases of Mr. Cruikshank's remarks were those dealing with the subjects of "Bench-made Law," "The World's Wealth" and "The High Cost of Living." Plainly, Mr. Cruikshank believes in large fortunes, well-managed, and backed up his remarks by saying that such monies (or wealth) invested, in stocks and bonds or real estate, make possible the carrying on of large industries which employed men, built houses, which meant cheaper rents and better living quarters for such men, and created a state of educational uplift which otherwise would not be called for and would be obtainable by the well-to-do. Truly, Mr. Cruikshank put a lot of entirely new subjects, with different arguments for each, in the minds of all assembled, and his auditors regretted when he stopped talking. However, he has promised another talk for the future. Mr. Sprague, the second speaker of the evening, announced his subject as "The Application of Electricity to Domestic and Industrial Heating Devices." Mr. Sprague's long connection with this development in the electric field proved him a most interesting talker; and, to add to his presentation, pictures showing the different devices and their utility were thrown on the screen. Of course, we all like to look at pictures. Mr. Sprague concluded his remarks by passing among the audience sample heating elements, that those assembled might be thoroughly acquainted with them. Mr. Sprague's remarks concluded the evening's literary entertainment. All hands were then served with a buffet lunch and cigars, after which the assemblage departed for home, apparently well satisfied that they were able to be present.—A PARTICIPANT.

CLEVELAND SECTION, THE "GAS MEETERS."—The Cleveland (O.) Section of the "Gas Meeters" is an accomplished organization. On the evening of the 21st inst., a primal election was held for certain offices which resulted in these choices:

For Commissioners.—Messrs. C. D. Halford, C. J. Riordan and F. R. Hutchinson.
Secretary and Treasurer.—Mr. Holtz.

Later on the Commissioners will name a Chairman. At the outset the membership comprises 75, of whom 63 were in attendance at the election meeting. So far (of course, the body and its doings are really in the initiatory stages) the body has agreed on holding a meeting every other Friday night, and 8 bowling alleys (a complete set) have been reserved for each Friday evening in the Monroe Hotel. The Company, Mr. Hutchinson and his associates are agreed in believing that this Association will well serve the Company and the men.

CURRENT MENTION—

INQUIRIES have been sent out by the Indiana Lighting Company for propositions on a 3 million cubic feet daily capacity coal gas plant. New works are to be erected at Fort Wayne, Ind., to furnish gas, not only to that point, but also to the outlying centers of Wabash, Peru and Logansport. That the first installation projection is along large lines will readily be comprehended when it is known that the predicated cost of the plannings, including an estimate for pipe lines, has in no instance been figured at less than $1,500,000. This proposed installation, and its entailed expenditure of the sum named, are in line with present coal gas activities, due, of course, to the prevailing conditions of the oil market in respect of matters governing price and supply of that material.

WE are indebted to "W. J. K." for the information that Mr. Allen C. Douglas, formerly with the Missouri Firebrick Company, is now associated with the gas division of the Evens & Howard Firebrick Company.

"BADGE 1068," writing from Chicago under date of the 21st inst., sends along many interesting "notes," from which we extract the following: "* * * I inclose a set of 'stickers' which have been 'smeared' to every gas account sent out since early this month. As you see, the slip calls attention to the fact that, beginning the 3d prox., and lasting until the 12th, a huge Educational Exposition will be held in the Coliseum, the purpose of which is to show the newest, most up-to-date things used in the home. There will be thousands of exhibits on display, and the Coliseum people will furnish music during afternoons and evenings. The Peoples Gas Company has arranged to pay ½ the cost of admission (50 cents) to the 'Show,' and to facilitate such proposition, the sticker carries 4 coupons (perforated and detachable) the presentation of one which, with 25 cents in addition, entitles the presenter to one admission, afternoon or night. The first 'Household Show' happened last May, and it was largely attended, the 'dear' ladies flocking to it in great numbers. The display of domestic light and fuel appliances was simply great, and it resulted in the sale of a larger number of modern gas appliances than the records of any previous season's show. A very notable exhibit was that of the Humphrey Company, of Kalamazoo, Mich., showed a model of a 'Kalamazoo beauty' dressed in *noveaute mode de Paris*, who was in constant activity, turning on and off the hot water faucet; in fact, the model was so true to life that a great many, taking her for the 'real goods' were shocked at the 'baby stare' received in return for their 'advances.' The Strause gas iron makers were also in evidence. They had impressed the services of two swell 'laundry ladies, from Philadelphia,' who were kept busily engaged in ironing 'divers things,'' several of which had a singed appearance ere the show was at an end—of course, I meant the 'divers things' in that 'singed' reference. That they were on their job would seem shown when I narrate the fact that 52,000 + 'Iwantu' gas irons had been disposed of during the season in Chicago. The Eureka Water Heater Company, of Chicago (I wonder why that concern does not advertise with you), was also well represented, and its people report a large increase in sales in 1912 despite that it was Presidential year. Jolly 'Harry' Stratton, for 25 years stove expert with the Peoples Gas Light and Coke Company, but since 1909 with the Champion Stove Company (Cleveland, O.) was a busy explainer concerning the 'Two-in-One Champion Range.' He also declares that business was better this year than ever. The 1913 exhibition will undoubtedly outshine the one of a year ago, and it will be well worth a visit from gas people, resident of other States and cities. The arc and amberglow light campaign is in full swing; in fact, the former is always

swinging, and really it keeps the installation force on the jump to cope with the orders coming in daily. Let me wish the JOURNAL staff the compliments of the season."

MR. W. E. HARTMAN, Consulting Engineer and expert in the construction of gas ovens and coke ovens, has been retained by the Gas Machinery Company, Cleveland, O., in a consulting and advisory capacity in connection with its oven department. As our readers know, Mr. Hartman has had extensive experience in the gas and coke oven business, having been associated with the H. Koppers Company, coke oven constructors, of Chicago, first as gas engineer in the construction of by-product coke ovens, and lately (up to the first inst.) as Managing Engineer of that Company.

MR. "FRED." PEITER, formerly Constructing Engineer of the Corey (Ala.) by-product coke oven plant of 280 ovens—built to the order of the U. S. Steel Corporation—and lately Assistant Managing Engineer of the Koppers Company, has also accepted a position with the Gas Machinery Company to take charge of the designing and construction of gas ovens and coke oven plants.

PRESIDENT MCDONALD, the man at the helm of the Public Service Corporation, of Long Island, N. Y., the gas pipes of whose concern will shortly extend from Freeport, on the south, to PortWashington, on the north, of that stretch of land which in 50 years' time will be housing 20 millions of people, was tendered a public banquet (the night of the 21st) at Bradley's Hotel, Port Washington. The banquet was tendered to Mr. McDonald by a number of the residents of the named famous sand dunes in recognition of his offices in supplying Port Washington with gas.

THE employees of the Salem (Mass.) Gas Light Company have formed an Employees Association, to meet monthly, the object being mutual improvement and social betterment. The initial meeting was held in Franklin Hall, the evening of the 18th inst., when a goodly number listened to a narration (by that expert on such instruments, Mr. H. A. Norton) on the "Workings of the Gas Meter."

THE annual meeting of the heads of departments of Messrs. Shapiro & Aronson, held at "White's," Fulton street, New York, Saturday evening, the 21st inst., brought forth a surprise, in the form of an unusual Christmas gift from the firm to the employees, under which any of the employees desiriug to enroll in the "Sheldon School" will have half of their tuition therein paid. This feature of the next season's work was dwelt upon at the meeting, which followed close after the annual dinner, by Mr. Loyal Wright, of the "School." A much more intimate talk, full of encouragement and spirit, was that of the Sales' Manager, Mr A. F. B. Harraden. A general discussion, taken part in by the 25 present, ended a most enjoyable sitting.

THAT the Kentucky Heating Company is operating in the city of Louisville, Ky., without a franchise, is the opinion of Judge Quarles, in an opinion given from the bench about mid-December. The case concerned in the opinion is that of Z. T. Underwood against the Kentucky Heating Company, which has been under trial and advisement for some time. The Court asserts that defendant, which supplies fuel gas in the city, has been occupying the streets and public thoroughfares with mains and pipes and without legal authority since August 11, 1908, when its franchise expired by limitation under the ordinance by which it was granted. Judge Quarles directs the city of Louisville, within an agreed time specified in a judgment to be drawn, to offer for sale a franchise similar to that heretofore held by the Kentucky Heating Company, and should the Kentucky Heating Company not be the purchaser, then such further orders may be entered as may seem proper.

ACCORDING to recent advices from Cincinnati, O., Magistrate R. M. Dempsey has issued to the Rev. Oliver L. Seward a judgment for $1.02 in his suit against the Union Gas and Electric Company. The Company was also ordered to pay the costs. The suit was instituted by City Solicitor Bettman on behalf of the Rev. Seward to test the right of the Company to charge a fee for turning off the gas at one place and turning it on at another; as, for instance, when a consumer removed from one house to another house. Magistrate Dempsey held that Stewart was entitled to receive his dollar, with interest at 6 per cent., since the removal date pleaded in the suit, which date was September 11, 1912.

THE industrial department, recently established by the Danbury and Bethel (Conn.) Gas and Electric Company, in the basement of the Library building in Danbury, is being most successfully conducted, if many sales of various industrial apparatus can be taken as evidence in support of the contention. Gas and electric appliances for laundry, and washing machines and other kitchen work are shown in variety, and the like may be said of vacuum cleaners, candy and ice cream making apparatus, dough mixers, etc.

ON the 18th inst., the Attorney General of Massachusetts (Hon. James M. Swift) instituted proceedings to enjoin the Haverhill Gas Light Company from transferring any of its physical properties to the Haverhill Gas Company, on the allegement that it is arranging to sell its stock at the market price instead of at par, as the law prescribes.

THE Kanawha Water and Light Company and the South Side Water and Light Company, of Charleston, W. Va., have been taken over by the West Virginia Water and Electric Company, a corporation capitalized in $1,000,000.

Book Reviews.

"*Light, Photometry and Illumination.*"—By Prof. W. E. Barrows, Jr., University of Maine. McGraw-Hill Book Company; 335 pages; 200 illustrations; price $3.

A revised and enlarged edition of "Electrical Illuminating Engineering" by the same author, which includes the results of a number of reports and papers written during the past few years. It is essentially a text book for teachers, and has been gotten together much as a collection of musical gems, each of which is valuable from various standpoints. While the authors selected are all of some prominence many of the statements have been questioned; and rightly, owing to the present state of the art. The architects, decorators and artists who control the lighting installations of note, in the large majority of instances, have not been convinced that a foot candle value on the "working plane" is essential, or that dark walls are at all essential in producing good effect. In street lighting, moonlight conditions are rarely sought after, and never attained, by artificial means, so that they may hardly be called standard. The author lays himself open to the charge that collegiate instruction is too theoretical as but few of the facts elaborated are used in practice. As a reference work, or as a text book, it will undoubtedly be useful and valuable.

Publications.

[All Publications, Catalogues, etc., mentioned below, are kept in our office for the convenience of our patrons.]

"*The Mueller Record.*"—The current Christmas issue of the publication, maintained amongst, by and for the employees of the H. Mueller Manufacturing Company, of Decatur, Ills., contains many items of serious trend, along with much in lighter vein. Indeed, 24 pages are required to present all of the good things in this number, of which the colored cover design is not the least attractive feature.

"*The Electric Vehicle.*"—Another attractive Christmas edition is that concerning *electrics*, issued monthly by the Denver (Col.) Gas and Electric Light Company.

"*Gas News.*"—The January number of the monthly pamphlet "Gas News," issued by the Consumers Gas Company, Toronto, Canada, while inexpensively gotten together, has more to commend it than some of its more pretentious contemporaries.

"*Hydraulic Machinery.*"—Hydraulic apparatus used in the rubber and celluloid industry is described in detail in Catalogue 7, of Messrs. R. D. Wood & Co., Philadelphia.

"*Street Lamps.*"—From the original type boulevard globe to the modern cluster style, illustrates a full line of street lamps. The Catalogue is No. 47, from the well-known lamp maker, Mr. Thos. T. W. Miner.

"*Concerning Municipal Ownership.*"—A monthly publication devoted to the portrayal of the ills and weaknesses of municipal ownership. A list of defunct municipal lighting plants is included. And the list is not the least interesting thing between the covers of the pamphlet.

(*Continued from page* 423.)

supplied through a flexible connection (*F*), and the products carried off through a cone (*D*) and pipe (*E*). Ventilation is obtained by suitably screened openings in the bottom and the top of the shell, which is made in several sections.

To make readings the standard lamp (S_1), which is shielded from the test plate (*Z*) by a properly translucent paper screen (J_1), is oper-

UNITED GAS IMPROVEMENT COMPANY

PHOTOMETRICAL LABORATORY

LAMP LIFE-TEST RECORD

Test No. –
Plate No. –
Photo No. –
Boston No. –

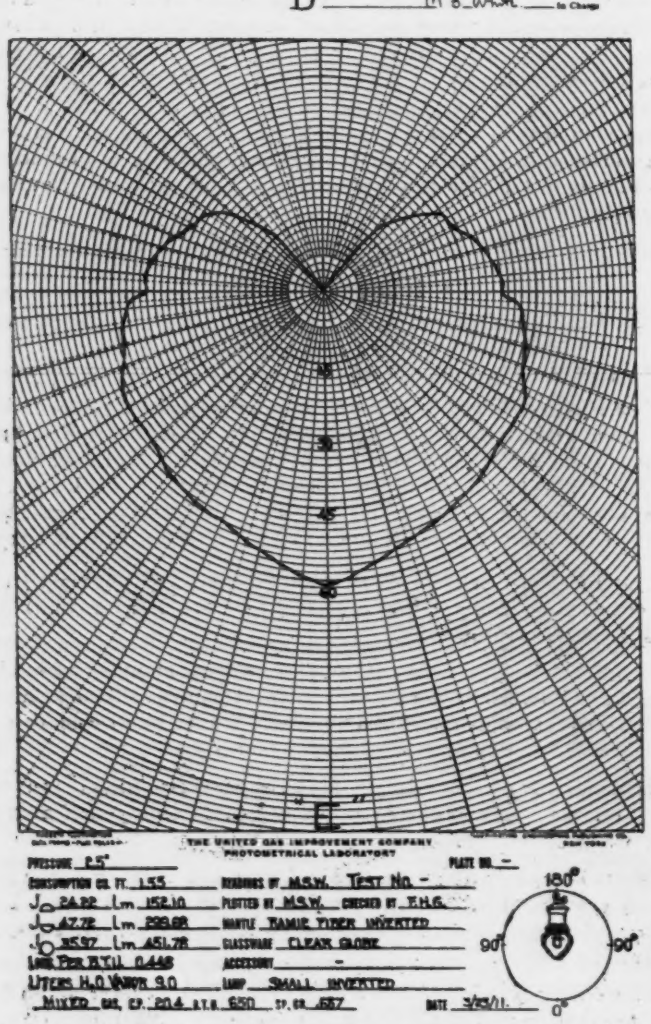
Data Sheet No. _____

Make of Lamp _____ Type Small Inverted No. of Burners _____
Where Hung Sudbury Bldg. Test Room No. Mantle Preserve –
M.S.C.P. before life-test 33.6 1913 Data Sheet No. 1
M.S.C.P. after life-test 34.5 " " " " 1
Percentage change (+ or –) +2.7%

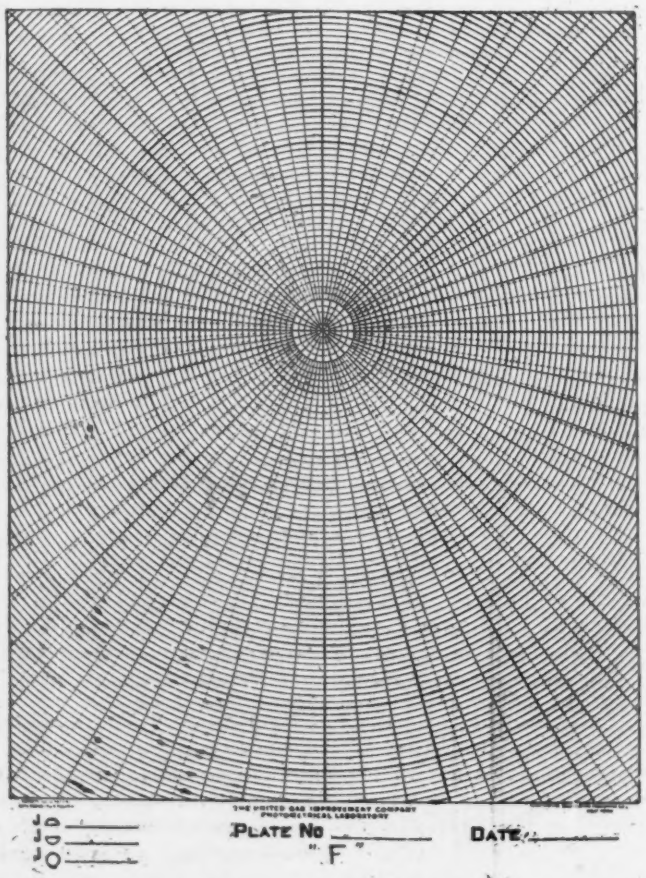
DATA OF TEST

Date	Lighted	Extinguished	Hours	Condition when Extinguished	REMARKS: Globe, Mantles, Adjustment, Weather, etc.
4/10/11	9.00 AM	4.00 PM	7	No appreciable change.	
4/11/11	9.00 AM	4.00 PM	7	Mantle breaking slightly at shoulder. Lamp hard to light each time as one jet often must remain open. Needle valve and jets open.	
4/12/11	9.00 AM	4.00 PM	7	Mantle carbonized at 3.45 PM due to drop in pressure from 2.5" to 2.0"	
4/13/11	9.00 AM	3.00 PM	6	Mantle was very badly damaged. No more breaking observed.	
4/15/11	9.00 AM	12.00 M.	3	No more carbonization - pressure 2.5"	
4/17/11	9.00 AM	3.00 PM	6	No change from 4/13/11. Lamp burning O.K.	
4/18/11	9.00 AM	3.00 PM	6	O.K.	
4/19/11	10.00 AM	3.00 PM	5	O.K.	
4/20/11	10.00 AM	1.00 PM	3	O.K.	
		Total	50 hrs.		

D _____ M. S. White _____ In Charge



ated at its correct voltage and amperage by means of ammeter (*A*), voltmeter (*V*) and resistance (*T*). The lamp (S_2) in the luminometer (*I*) is set at the proper M.S.C.P. reading or some even multiple of it on the scale. Then, by various combinations of the screens in the box (*D*), the voltage is adjusted by resistance (T_2), so as to form an intensity balance at (*D*). (S_1) is then extinguished and (S_2) set at the voltage obtained. The test plate (*Z*) is protected from the lamp (*L*) by a screen (J_2), similar to (J_1). By this means readings made with the lamp (*L*) are direct. The sphere is painted inside with flat, white, cold water paint. The gas connections are similar to those of the 5-meter radial bar. Lamps consuming up to about 30 cubic feet per hour may be tested, but above that quantity the ventilation is in-



sufficient for continued use, and the lamp tends to smother, so that for such lamps reading must be made quickly after proper adjustment and closing the sphere.

Other auxiliary apparatuses used are:

Junker's calorimeter; Schilling's orifice specific gravity apparatus: electric motor, rotary compressor set with compression tank, regulator and gauge.

Tabular Forms Used in Test and Calculations Involved.

To cover the calculations required in the tests above, a set of 7 forms is required so that all other work necessary may be done on a slide rule. Most of these forms are self-explanatory.

(*A*) *Qualitative Gas Test.*—On this sheet is recorded all the data descriptive of the gas used, which can be referred to at any time for corroboration. It includes description of sample, calorific value, specific gravity, candle power (as determined by the open flame) and chemical analysis. The last named is made only on special occasions.

(*B*) *Light Distribution in Vertical Plane.*—The light issuing from the test lamp may be conceived as illuminating an inclosing sphere of unit radius. As gas lamps are symmetrical about a vertical axis, their light distribution in 1 vertical plane through that axis will be a fair indication of the distribution in all other vertical planes. The surface of the sphere may be conceived as divided by horizontal planes into 20 equal area zones, 10 of which are in the upper and 10 in the lower hemisphere. The intersecting circles of these planes with the sphere's surface would appear, in a vertical sectional plane, as points on the circumference and the inclosed arcs between these points would represent the zonal widths. In our radial photometry the zones may be indicated by their angular distance from nadir or 0°, and the light intensity in a given zone would be indicated by the candle power as measured at the angle representing the position of its weighted mean area. Such are the angles indicated in the first column of the sheet.

If the substitution method is used the candle power values, as calculated from the slide rule, are entered in the corrected candle power

column and another calculation is made for mirror absorption to obtain the apparent true candle power. By choosing these 10 equal zones in each hemisphere, $\frac{1}{10}$ of the sum of the 10 apparent true candle power values is equal to the mean hemispherical candle power and the mean of the upper and lower hemispherical candle powers equals the mean spherical candle power.

$$\text{Lumens} = \text{M. S. c. p.} \times 12.56\ (4\pi),$$

$$\text{M. S. candles per cu. ft.} = \frac{\text{M. S. c. p.}}{\text{Corr. Cons.}},$$

$$\text{Lumens per gross B. T. U.} = \frac{\text{M. S. c. p.} \times 12.56}{\text{Corr. Cons.} \times \text{Corr. B. T. U. (gross)}}.$$

All results are subsequently checked by another person than the one making the test.

(*C*) *Integrating Sphere Test.*—The spaces at the top of this sheet correspond to those on (B). M. S. C. P. values are an average of several readings made to obtain the maximum efficiency at each pressure. The columns marked "After life-test" include the readings taking with clean and dirty glassware and with "supplied" and "standard" mantles. The "standard" mantle readings made before life-test are also entered with the mixed gas tabulated data.

(*D*) *Lamp Life-Test Record.*—The headings here correspond with (B) and (C). Under remarks are entered all points of interest, such as flashbacks, carbonization, mantle or globe breakage or necessary change of adjustment.

(*E*) *Small Curve Sheet.* (*F*) *Large Curve Sheet.*—These two forms are of the well-known form of polar diagram and on them are plotted the corrected vertical distribution curves.

On (E) complete data of conditions under which the curve is made are given, together with a small sketch of the appearance of the lamp in the plane of distribution. The solid radical lines represent 5° angles while the dotted lines are the "equal zone" angles on which the readings are taken.

Sheet (F) is used where an enlargement is required for the comparison of special curves obtained under similar conditions.

Efficiency Factor and Some Results Obtained.

In the results obtained after long research by M. DeVille, and reported at the International Photometric Commission at Zurich, it was fairly well-established that the light given by an incandescent gas burner was almost directly proportional to the net heat supplied by the gas when burned under proper conditions; that is, when the burner is best adapted to the gas used, and a perfect mixture of gas and air can be obtained with the flame completely filling the mantle. Therefore, a burner will not give the same thermal effieiency when used on a rich or a lean gas. Conversely, it should be possible to obtain the relative adaptabilities of 2 or more burners by a comparison of their efficiencies on a standard or nearly uniform gas. This would certainly be a measure of the usefulness of any burner or burners in a town or city where a fairly constant grade of gas is furnished the year around.

Also, as the total light given by any lamp is the quantity that it is desirable to know, in making calculations and comparisons, irrespective of the form of the distribution curve obtaincd under any fixed set of conditions, it would be fitting that the comparative efficiency factor as supplied by the result of a test be measured in total lumens per British thermal unit per hour, both being measures of quantity of energy, one given out and the other put in. Also, by this measure we are able to ascertain, through the use of the three gases mentioned, on which of these gases the burner as equipped would be most efficient.

The actual numerical value of the quantity "lumens per B. T. U. per hour" for the various types of incandescent gas lamps on the market lies between 0.2 and 0.7, is a number that can readily be remembered and that is simple in its order of digits.

It is not reasonable to suppose that the heat of condensation of water vapor will ever be capable of use in the heating of a mantle, so that this factor of "lumens per B. T. U. per hour," it might be thought, should be based on net B. T. U.'s. The factor is intended, however, to show the true relation between energy input and illumination output, and so total "B. T. U.'s" should be used. This is one factor in accounting for the lower figures usually obtained for coal gas, high in hydrogen.

In the following table is given a number of commercial efficiencies as obtained by the above outlined process during the past 2 years. The results obtained on coal, water and mixed gases are given for each lamp, using the gross heating value, for the reason given above, and as recommended by the American Gas Institute. The 10 lamps referred to in the table are described as follows:

I.—1-burner, inverted high pressure lamp.
II.—1-burner, inverted high pressure lamp; air supplied under 2.1-inch pressure.
III.—4-burner, low pressure inverted outdoor arc.
IV.—4-burner, low pressure upright outdoor arc.
V.—3-burner, low pressure inverted indoor arc.
VI.—1-burner, low pressure upright indoor arc.
VII.—1-burner, low pressure inverted indoor unit.
VIII.—1-burner, low pressure upright indoor unit.
IX.—1-burner, low pressure inverted miniature unit.
X.—1-burner, low pressure upright miniature unit.

All glassware clear or corrected for absorption.

Lamp.	Gas. Kind.	Sp. Gr.	B.T.U.	Liters. H_2O.	Press.	Cons.	M. S. C. P.	Lumens. B. T. U. Per Hr.
I.	C.	0.540	568	26.0	2.0 lbs.	14.46	283.0	0.537
	W.	0.708	614	32.0	2.0	11.37	338.0	0.627
	M.	0.690	614	26.0	2.0	12.63	396.0	0.640
II.	C.	.....	...	....	...	.....	.....	.....
	W.	.....	...	....	...	.....	.....	.....
	M.	0.640	638	....	2.0 ins.	8.24	242.0	0.578
III.	C.	0.495	612	17.0	2.5	15.14	212.0	0.288
	W.	0.700	654	16.0	2.5	14.50	191.0	0.251
	M.	0.669	658	16.0	2.5	14.56	212.0	0.283
IV.	D.	0.471	554	10.0	2.5	24.86	141.0	0.131
	W.	0.720	630	10.0	2.5	18.85	219.0	0.230
	M.	0.672	603	13.0	2.5	19.84	232.0	0.233
V.	C.	0.495	585	10.0	2.5	11.55	141.0	0.265
	W.	0.703	673	12.0	2.5	9.98	184.0	0.345
	M.	0.655	649	12.0	2.5	10.08	188.0	0.362
VI.	C.	0.432	590	8.0	2.5	10.54	120.0	0.239
	W.	0.708	654	11.0	2.5	10.34	144.0	0.269
	M.	0.659	630	13.0	2.5	9.61	148.0	0.306
VII.	C.	.....	607	7.0	2.5	4.32	71.9	0.345
	W.	.....	653	7.0	2.5	4.05	76.6	0.364
	M.	.....	647	9.0	2.5	4.06	79.6	0.375
VIII.	C.	0.454	621	20.0	2.5	3.55	50.5	0.288
	W.	0.722	623	25.0	2.5	3.00	56.8	0.382
	M.	0.652	618	25.0	2.5	2.89	55.2	0.388
IX.	C.	0.400	609	21 0	2.5	1.47	28.0	0.394
	W.	0.695	601	21 0	2.5	1.60	37.8	0.440
	M.	0.677	661	21.0	2.5	1.73	35.0	0.384
X.	C.	0.452	592	26.0	2.5	1.57	23.5	0.319
	W.	0.717	632	26.0	2.5	1.21	27.0	0.443
	M.	0.674	641	27.0	2.5	1.26	28.4	0.440

The increase of efficiency with the smaller lamps seems to coincide with conclusions made by Mr. F. H. Gilpin, in his paper read before the Illuminating Engineering Society convention at Chicago last vear

Notes of Interest and Conclusion.

Critics of the photometric method outlined above will have noted the fact that no correction means have been used to eliminate the difference in color of the 2 fields in the sight box. Other points may also be mentioned that would insure greater accuracy of work. It must be remembered, however, that the chief object of this paper was to describe a practical method found convenient for the comparison of commercial lamps, and not to describe ultra-scientific determination of the qualities necessary in a burner for obtaining the maximum efficiency on any particular kind of gaseous fuel. We feel that the laboratory has met the first requirements laid upon it, and that now is to come a gradual increase in research work and in refinement in method and apparatus necessary to its successful prosecution.

Mr. H. S. Whipple, Manager of the Rockford (Ills.) Gas Light and Coke Company, has informed the residents, that, in accordance with the agreement recently made with the city, the Rockford Gas Light and Coke Company, announces that, on January 1st, 1913, the gross price of gas will be reduced to $1.05 per 1,000 cubic feet. To consumers paying bills on or before the 10th day of the month in which the bills are due, the net price will be 95 cents per 1,000 cubic feet. No bills will be rendered for less than 50 cents per month, which rates apply to both prepayment and regular meters.

Special English Correspondence.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, December 10, 1912.

Modern Results with Vertical Retorts of Continuous Carbonization. —A Case of Trade Jealousy.

About 10 years ago I was concerned in what I believe to be the pioneer work as regards the practicability of the vertical retort and of continuous carbonization. I refer to the trial of the Settle-Padfield process at Exeter, which established the fact that it is possible by these means to get results far exceeding the capabilities of any horizontal retort, both as regards yield and quality of the gas. It is true that Murdoch made some of his earliest test with a coffee pot shaped retort, and that other inventors in later periods have had a shot at the system. But Mr. Thomas Settle is entitled to the credit of showing that there was a future for the vertical retort. Ever since 1903, there has been much activity in that direction, and a great deal of attention has been given lately to the merits and demerits of the various systems now before the public. The chief of these in England are the Woodall-Duckham and the Glover-West. And on the continent, the Dessau retort. The English systems are on the continuous principle, both in regard to charging and discharging. But the German is intermittent, being filled at one time, like the horizontal retort. The following figures, from official tests, are interesting as showing the latest workiag results with the Woodall-Duckham retorts. A setting on this principle was erected under guarantee at Lausanne, to give 12,000 cubic feet of gas per 1,000 kilogrammes (0.98 English ton) of coal carbonized, mean calorific power 570 B.T.U., make per bed 123,600 cubic feet per 24 hours, and 30,900 cubic feet per retort. Coke used as fuel, 16.18 per cent. The tests carried out by the purchasers showed that the above estimate was much too moderate. The average of 6 days working, during which time nearly 40 tons of coal were used, showed a make of 12,492 cubic feet per 1,000 k., calorific power, 595 B.T.U. Coke used as fuel 10¼ per cent., make per bed per 24 hours 150,000 cubic feet, and per retort 37,500 cubic feet. The mean specific gravity of the gas was 0.469. Put into English terms, this means 12,750 cubic feet of 15 to 15.5 candle gas per ton of coal carbonized. A second test is the everyday working results at Luton, of two settings over the four months ended October 31, 1912; 4,240 tons of coal were carbonized, yielding 54,257,000 cubic feet of gas, or 12,795 cubic feet per ton. The average illuminating power (No. 2 Metropolitan burner) was 16.4 candles. It is remarkable that the results at Lausanne, from German coal, should agree as closely with those at Luton with English coal. And there is also a very close agreement with the results obtained at Exeter in 1903.

At Luton, working the same class of coals in horizontal retorts, the results of 6 months' working were 16,047 tons coal carbonized, 181,764,000 cu bic feet of gas made, equal to 11,327 cubic feet per ton; illuminating power, 18.3 candles.

These results are most promising, as compared, not with horizontal retorts, as worked according to the piled up experience of the last 50 years, but with the horizontal retort at a similar stage of its existence. After 50 years' experience with the vertical retort and continuous carbonization, there is good reason to believe that the results obtained will be as far superior to those obtained to day, as the figures claimed for the latest working in horizontal retorts are in comparison with the records of 1885 to 1890.

A meeting of the Southern District Association of Gas Engineers, held in London last month, is notable for an innovation that I have more than once suggested; namely, that the papers for discussion should be printed and issued to the members in advance, and taken as read at the meeting. The advantage of the arrangement is considerably more than a saving of time, though that is of some importance, especially at an afternoon meeting when the time occupied by the whole proceedings is limited to 2 or 2½ hours. It may be taken that the business time of a gas engineer carries a tangible value, and that the loss of say 5 minutes at a gathering of 100 represents a sum by no means trifling. But as the result of the Southern meeting, we are able to compare the discussion by speakers who have read the whole paper with some degree of care, with discussions on previous occasions, partly conducted by speakers who have incompletely or imperfectly followed the reading. Sometimes the misunderstanding is not the fault of the reader. It is disconcerting to a reader who is unaccustomed to public speaking, to be asked to hurry up, and probably he endeavors to meet the demands of the chair by gabbling, or by omitting important parts. Very often it would be more considerate to all parties, reader, speaker or hearer, to postpone rather than to hurry. One reason for the excellent discussion at the meeting under consideration was the subjects of the papers, and the style of treatment. Somebody said—I think it was Napoleon—that every soldier has a Marshal's baton in his knapsack. And almost every engineer has some valuable suggestions in his private note book. Many of these, by the way, are lost for want of systematic record. I knew a man once that had a pocket book of about 1,000 pages, and ever so many love slips. But it took him a long while to hunt out what he wanted, and the time he wasted in searching would soon suffice for the working up of a subject index. Mr. Fisher, of Tottenham, commenced with "Reinforced Concrete Work." Mr. Gill, of the Commercial Gas Company, followed and introduced retort house furnace charging and other details. And Mr. R. George Head, of the South Metropolitan, made an excellent finish with pipe jointing and main laying. These were all topics on which many would find something to say, and which would under any circumstances secure a fair discussion. But after due allowance for this, the new departure can claim some share of credit as improving the quality of the discussion. There was a directness and point about it that are sometimes sadly wanting in discussions conducted on usual lines, and a refreshing absence of the stop gap speaker, who is always willing to round up a discussion on any subject, and also of the gentleman "Who only heard the last part of the paper, but would like to suggest"—and after a somewhat lengthy prelude on lines like these, goes on to traverse matters that have been fully dealt with in the early part of the paper.

There has always been a certain amount of antagonism between chemical manufacturers and gas companies, commencing with the time when the last named became conscious of the fact that their residuals were their own property to do as they liked with. So long as manufacturers could obtain the ammoniacal liquor and tar at their own prices, and work their own comfortable little arrangements as to not competing with each other, there was no complaint. But as the industry expanded and the production of residuals followed in proportion, gas engineers began to ask why it was that, with sulphate of ammonia quoted at £20 per ton, and all sorts of products being extracted out of tar, they could barely get prices sufficient to pay for the carriage of the stuff off the works. One after another began to put down a sulphate plant, until an appendage of this sort has become the usual thing in works doing anything over about 1,000 tons of coal per annum. Some of the large works took up the distillation of tar, and smaller ones went in for artificial asphalt. Much of this could have been nipped in the bud by a little judicious liberality in the matter of price, on the part of those who are now complaining, and a very natural presumption is that as so little could be obtained for the raw materials, there could not be much loss to anyone when they were lifted off the market.

From this position of affairs arose considerable dealing between gas companies themselves. In a district of half a dozen or so small concerns, all within easy reach, one of the number would put down a bar still or a sulphate plant. Individually, such a step would barely pay, but he counted upon buying materials from his neighbors on fair terms, in sufficient quantity to get a working out of his plant, sufficient to make a profit out of it. Larger works not only dealt with bar and sulphate, but put down vitriol chambers and made up their own acid from the spent oxide. Here again was considerable opportunity for mutual accommodation. The large concerns, having surplus plant, naturally preferred to see it working rather than idle, and bought up materials from their smaller neighbors. The result has been not an increase of profit to the gas industry, but a reduction of working expenses that has enabled them to strengthen their position as regards competitors by reducing the price of gas. The consumers are directly benefited, the companies indirectly so, but the chemical manufacturers do not come in. Why they should expect to do so is not very clear. A man's, or a company's, property is his own, and in this free country he or they claim the right to deal with it in the most advantageous and profitable manner. The grocer, for instance, when he strikes on a new line, doesn't send to ask his competitors across the road whether there is any objection, or if the proposed plan would be acceptable. Similarly, why should a gas company be expected to ask the consent or approval of chemical manufacturers, individually or collectively, as to the disposal of its residuals.

In this position of affairs, the chemical manufacturers are falling back upon well worn tactics that were originated in the city of

Ephesus over 1800 years ago. "Not only will (the most appalling public calamity that can possibly be suggested to be filled in here) but this our craft is in danger," is an argument that has been freely utilized for political objects or for purposes of gain, in almost every page of history. They have introduced the third end of the wedge by bringing a bill into Parliament, which on the face of it bears the appearance of reason and moderation. They advert to some extent the very obvious proposition that any gas company can do as they wish in the matter of working up their own materials. If any concern wish to make sulphate, or distil tar, or work up spent oxide of iron they are at liberty to do so, and to purchase acid or other extraneous material that may be necessary for that purpose. But they are to be prohibited from buying or selling to another company. Why? Because for various reasons the second company is in a favorable position for working up the material, than the manufacturer. It can raise capital cheaply, probably has surplus working capacity, or land, that it is glad to turn to account and, therefore, can well afford to outbid the chemical manufacturer. It is the business of the gas company, they urge, to make gas, and not to deal in chemicals. But as a matter of fact it is the business of gas companies to deal in chemicals or in anything else that is incidental to the main object. To say that they have to make gas is only half the story. They have to consider their customers by selling it at the lowest rate, and if one of the operations incidental to this object is to buy and sell to neighboring gas undertakings, or to enter into agreements with a view of getting the best value, not only is there no reason on earth why they should fail to do so, but such failure would be a gross neglect of duty. The complant of the small trader in a back street against the large establishment bedecked with marble and plate glass in the main thoroughfare, is of exactly similar character, but the public persist in going where they are best served. The proposed bill is now under the consideration of a Parliamentary Committee, and some of the best authorities in the country are giving evidence for and against. The small tradesmen cannot command sufficient influence to get a hearing in Parliament. Most of the evidence advanced by the chemical manufacturers goes to show that under the present arrangements both gas companies and consumers are benefited, and that there is no reason why consumers should pay more for their gas, or companies divide less profit, in order that a place may be made for the chemical manufacturer. I cannot imagine that such a curtailment of liberty will pass into law. But if by any chance it should do so, the matter will be followed up by attempts of further restriction, not only with regard to dealing with neighboring gas companies, but also as to working up the home production. The goal in view is a return to the conditions that prevailed about 1860.

New Methods and Appliances.

HIGH PRESSURE GAS LAMPS, PENNSYLVANIA GLOBE GAS LIGHT COMPANY'S TYPES.—Replying to a correspondent, who inquired for information respecting new types of lamps, put out by the Pennsylvania Globe Gas Light Company, we have to say, through the courtesy of Mr. F. L. Rumble, Assistant New Business Manager, that the lamps are being made in two sizes, designated respectively as No. 5 and No. 11. The first named yields 500-candle power on a gas consumption of 10.5 cubic feet per hour; and the second lamp (No. 11) yields 1,100-candle power on a consumption of 22 cubic feet per hour, showing an efficiency of 50 candles per cubic foot of gas at 2 pounds pressure. The lamps are constructed to operate with all sorts of gas, manufactured and natural, and can be put on high pressure pumping mains, direct, the pressure being reduced by a special governor to 2 pounds. Where only low pressure gas is obtainable an inexpensive booster or exhauster equipment is provided, up to supplying 2 or more lamps, with gas at 2 pounds pressure constantly uniform.

The lamps are substantially constructed, without being in any sense cumbersome or heavy. The casing is of well-spun bronze, and the burner parts (being made of non-corrosive metals) are easily cleaned or may be readily removed without interfering with the lamp proper, and are adjusted to meet all kinds of gas conditions.

The ventilation features received especial attention during the working out of same, the result happily being an absolutely storm proof lamp, while, at the same time, the heated products of combustion are so distributed that the chance of globe breakage is reduced to a minimum. A special mantle has been developed for use with this lamp, which is of artificial silk and non-hygroscopic in character, and which it is claimed, during its average life of 400 hours, shows no depreciation in candle power yield.

High Pressure 2 Lamp, Post.

The Company has made several installations of these lamps in different parts of the country, some of which have been in use 3 years, with constant testing. During the maximum period they have been very greatly improved, more particularly though in respect of finish; but they now stand, according to the positive statements of the Company, as practical, efficient, high-power units for interior or exterior lighting, in situations demanding large volumes of light gained at remarkably low maintenance cost.

The compressing outfit consists of a booster or exhauster, a small electric motor, and all the necessary cocks and valves for its operating; also an equalizing tank, starting box and mercury pressure gauge. The current required for the operation of 15 high pressure gas lamps is 220 watts per hour. These lamps are equipped with pilot lights, so that the lighting and extinguishing are done from within the structure to be lighted.

The Company also manufactures special lamp posts for the high pressure lamps, the height of posts, for the No. 5 high pressure lamp, locating the center of the light about 14 feet above the ground level; those for the No. 11 lamp locating the center of light at 16 feet.

TWO NEW YORK CITY INSTALLATIONS OF HIGH PRESSURE LIGHTING.—During this season of long-hour lighting in New York two installations of high pressure gas lighting have been made, a fair idea of which may be gained from the illustrations herewith. The first example given had to do with exterior of the office and showroom of the Standard Gas Light Company, 32 to 38 West 125th street. The

installation consists of six 1,000-candle power bracket lamps, and two 1,500-candle power post lamps. The lamps are of the inverted arc type, with single mantles, and are operated at 3 pounds pressure, the latter being obtained by means of a small electric motor and booster. The second example was installed in front of the Branch Office, Consolidated Gas Company, 112 to 114 West 42d street. It consists of six 1,500-candle power lamps on the 42d street side, and four 1,000-candle power lamps on the 41st street side. The lamps used in both of these installations are manufactured by the Keith Light Company, and are of like design to those which have been successfully used in England. The approximate consumption of the 1,000 and 1,500 candle power is returned at 17 cubic feet and 24 cubic feet, respectively.

AN IMPROVED WASTE HEAT BOILER.—After several years of investigation, the United Gas Improvement Company announces the perfecting of a steam generator which makes use of the waste heat present, both in the blast gases and in the illuminating gas from a water gas apparatus. This steam generator, known as "The United Gas Improvement Company's Waste Heat Boiler," has reached a final state of perfection after numerous experiments and exhaustive tests, conducted with the apparatus, as installed at a number of gas works in which the Company is interested. Several of its features are novel, and have been covered by United States patents, and it is these special features which have made the device under consideration a commercial success, the neglect of which rendered unsuccessful all earlier attempts to utilize the waste heat from water gas apparatus.

It has been practically demonstrated that the volume of heat thrown away from a water gas apparatus will, when utilized in one of the Company's waste heat boilers, furnish sufficient steam for the sets, and also operate the blowing plant. The installation of the waste heat boiler also effects a large reduction in investment for condensing apparatus, and the cost in water purchased from the city, or pumped from well or river for cooling purposes. The saving in boiler fuel, when the waste heat boiler is installed, will show an earning, under certain conditions, of as much as 50 per cent. on the investment.

NEW LIGHTING SYSTEM, LUDLOW VALVE WORKS, TROY, N. Y.—In the main machine shop of the Ludlow Valve Works, a valve that has for a long time been in favor with American gas makers, has been discontinued, the substitute being found in the Keith high efficiency system of gas illumination, and all other departments of the works will shortly be lighted by the like agency. It is declared that the new system is more satisfactory, while the cost is considerably less. Under the former plan it was necessary to have an electric light on each machine, in addition to the light from the large (or arc) lamps. Under the new system sufficient light will be secured from the ceiling units, making the individual machine lights unnecessary. The machine shop carries a candle power of 56,000, which it is positively asserted can be operated at a cost of $1.10 per hour. The Keith lamp will in short time be manufactured in this country; and, according to some Trojans, it would not be surprising if the Troy Chamber of Commerce made a successful bid for the location of the Company's American factories.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,047,200. Gas Burner. J. C. Gehring, Pittsburgh, Pa.

1,047,201. Plant for the Manufacture of Carbureted Water Gas. A. G. Glasgow, Richmond, Va.

1,047,221. Incandescent Mantle. J. B. Hipwell, Philadelphia, Pa.

1,047,331. Gas Furnace. G. Sweet, Oakland, Cal.

1,047,348. Gas Generating Apparatus. H. F. Wallmann, Chicago, Ills.

1,047,385. Gas Burner. W. W. Clindinin, Chicago, Ills.

1,047,392. Gas Burner. H. V. Deemar, St. Louis, Mo.

1,047,435. Gas Range. F. A. Nieberding and E. V. Coulson, Cleveland, O., assignors to the Economy Stove Company, same place.

1,047,512. Manufacture of Carbureted Water Gas. A. G. Glasgow, Richmond, Va.

1,047.552. Apparatus for Lighting or Extinguishing Gas Lights from a Distance. J. F. Nassen, Solhem, and F. J. H. Rustige, Stockholm, Sweden, assignors to Aktiebolaget Lux, Stockholm, Sweden.

1,047,776. Device for Preventing the Escape of Gas from Gas Pipes. P. G. Fischer, Stuttgart, Germany.

Design 43,347. Inverted Gas Arc Lamp. H. Rubin, New York City. Term of patent 3½ years.

Items of Interest
FROM VARIOUS LOCALITIES.

THE new gas supply, to Emporia, Kas., by the Emporia Gas Company, the manufacturing plant of which, since October 1, 1912, is of the artificial type instead of the natural sort, is giving every satisfaction.

"F. K. W.," writing from Boston, Mass., under date of the 21st inst., sends along this newsy note: "At the last monthly meeting of Local Employees' Association, of the Suburban Gas and Electric Light Company, Revere, Mass., the papers read were on the subject of 'Tenney Service and Co-operation.' The respective authors were Messrs. O. J. Cookson, Superintendent, and Harry M. Frank, New Business Manager, of the named Corporation. These communications comprised the second set of a series of papers on the like subject which are to be presented by the heads of departments at these meetings. There was a large attendance of the employees, who seemed to well appreciate the excellence of the many points brought out by the authors in English not written above the comprehension of the hearers; but in grammatical and sequential English, all the same. The discussion proved whether or not the men appreciated the salient points in the papers, for the many questions asked were to the purpose, being even entirely within the pale of discussion. Another feature of the session was an address by Mr. Benjamin, of the Sheldon School, whose topic was 'Scientific Salesmanship,' 'The Employees' Association' is positively getting to be quite a feature of the Tenney commercial service, the value of which is reflected in the better and more harmonious working of the members of that service. It is possible that the Tenney combination will start a division looking to the better instruction of these members of its staff known as 'Cadet Engineers.'"

"H.," WRITING from Montreal, Canada, under date of the 20th inst., says: "* * * Dear JOURNAL.—The first meeting of the Employees' Association, of the Montreal Light, Heat and Power Company, was held last week at the Sailors' Institute, Montreal. After a collation provided by the Company, Mr. R. H. Balfour, Assistant General Superintendent, who is also this year Convenor, welcomed the assembly in well-chosen speech, in which was succinctly set forth the objects of the Association for this year. The principal aim of the Association is educational, and the feature of this year is to be the reading of papers from the Salesmanship Courses of the National Commercial Gas Association. The first two papers, on 'Organization' and 'Management,' were respectively read by Mr. Balfour and Mr. H. O. Lyons, the Auditor of the Company. The 'heavy' part of the evening's entertainment was agreeably interspersed with selections from the orchestra and songs by 'home talent.' An impromptu 'solo' on a dinner plate, by Mr. Brophy, to the familiar strains of 'Everybody's Doin' It,' was received with 'unmixed delight,' and, after repeated encores, he was made the recipient of a floral trophy, composed of four pieces of fern (not smilax) and a slice of bread. The presenter of gift, amongst other flowery (not floury) words remarked that the purpose of the donors was to present a trophy to Mr. Brophy; and that the word trophy was advisedly used, to denominate his bravery in taking any chance before such an audience with such a 'strophe.' Before the close of the meeting Mr. Balfour called upon Mr. J. S. Norris, the General Manager, for a few words. Our Manager (and 'Ours' he surely is) having expressed his gratification at the large attendance (numbering over 250), dwelt upon the social feature of the meetings, the benefits from which he regarded as fully important as those accruing from the educational part. The meeting closed to the swinging strains of 'For He's a Jolly Good Fellow,' all meant as a tribute to Mr. Balfour."

MR. CARL SOMDAHL, who has had charge for the Western Gas Construction Company of the construction work on the city gas plant at Valley City, N. D., has been appointed Assistant Manager of the Western Gas Construction Company, succeeding Mr. Thomas W. Stone, who has been promoted to the position of Manager. Mr. Somdahl has been with the Fort Wayne corporation for about 4 years.

WRITING about Mr. Carl Somdahl puts us in mind of the fact that his brother (Mr. C. P. Somdahl) has resigned from the service of the

Post & McCord Corporation, to enter the engineering force of the Consolidated Gas Company, of this city, likely under the division directed by Mr. H. W. Alrich. If we mistake not these youngsters (and likely ones they are) are nephews of the Guldlin dynasty. The writer was about to add, long may they live; but for fear (!) such designation might seem rather personal—each measures to 6 feet "long")—let us say: "May their years be many!"

"L. S. R.," writing from Baltimore, Md., under date of the 21st inst., says: "* * * I have just returned from a rather successful trip by way of Norfolk and Portsmouth, Va., back, and I am more than pleased to say that matters in the gas business in the named section of the South are going along even 'smoother than smooth.' I am inclosing something I gathered-in from our friend Ferguson, showing that sleepiness does not mar the gaze of the Portsmouth man. Incidentally, I might also remark that the Company is rejoicing over (not to say anything about the feelings of 'the citizens') and the inhabitants are 'pointing with pride' to the Gas Office Building. It surely looks good, even to one who lives so close to Washington, as do some relatives of the writer."

THE inclosure referred to above is in the shape of a 1 cent postal card, on the correspondence side of which this appears - the cards were sent out the second week in December:

"PORTSMOUTH, VA., Dec. 13, 1912.

"Dear Sirs: The Gas Company is now advertising, through the Portsmouth *Star* to Christmas shoppers, pointing out to them the *advantages of buying in gas lighted stores.* We do this in an effort to co-operate with our customers in their efforts to increase sales and trust more business will revert to you. Call on us for any assistance we can render. We will appreciate it if you will advise us promptly of any trouble with the service you are getting. With best wishes for a Merry Christmas and a prosperous New Year, we remain.—Yours truly, PORTSMOUTH GAS CO." Pretty slick work, that, Mr. Ferguson!

THE Court of Appeals, in a decision handed down last week, positively affirms the judgment of the Appellate Division, Supreme Court, which sustained the Companys' contention that the claim of the city that the Company's charter had expired, was without foundation.

SOME evenings ago the 18 members of the orchestra, organized amongst the meter repair men of the Consolidated Gas Company, 21st street and First avenue, New York, were the special guests of Miss Anne Morgan, in the Metropolitan Opera House. The hostess heard the gas men's orchestra about a fortnight prior to the evening above noted, and she was so well pleased with the entertainment that the invitation to the Opera House was the sequel.

SUPERINTENDENT H. C. CRAFTS, of the Pittsfield (Mass.) Coal Gas Company, has been obliged to notify the authorities that his Company, because of changed conditions, connot possibly reduce the gas rate to $1 per 1,000 cubic feet the first prox., according to its implied promise of a year ago. The main cause is the advance of over 50 per cent. in the price demanded for gas oil, and from the further cause that an all round increase in labor charges, approximating 35 per cent., has been experienced in the twelvemonth. The Company regrets this from all points of views; but the impelling factors may not be disregarded.

THE Public Service Commission, of Ohio, has authorized the Dayton (O.) Power and Light Company to take over the properties of the Xenia (O.) Gas and Electric Company. The electric current distributed in the latter named placed will hereafter be mainly derived from the generating station at Dayton, and the management of the business will be done through the Dayton offices, quite after the system followed in connection with the Piqua (O.) lighting properties, which were some time ago acquired by the Dayton corporation.

"C. L. B.," writing from Sag Harbor, N. Y., under date of the 21st inst., says:

Dear JOURNAL: I thought it possible a line or two from this garden spot, of beautiful Long Island, might interest you. We are building a holder to have a capacity of 100,000 cubic feet, the general contract for which was received by Mr. A. R. Cruse, of Trenton, N. J., but the actual construction work is being done by the Western Gas Construction Company. We have been working here in this respect rather close to the wind, our sendout this winter frequently going to a maximum of 60,000 cubic feet per day, and very often to 55,000 cubic feet, from a holder capacity of 15,000. However, "All's not lost that's in danger." The gentlemen in control of this property (at the head of whom stands that 24-carat gentlemen, Mr. Geo. E. Fahys) are quite satisfied over the fate that met Mr. O'dell's attempts to secure control thereof. It is quite likely that another merchant prince, in the person of Mr. James J. Riordan, abetted by his *alter ego*, Mr. G. Winfield Powell, will before long have started in this place a factory for the manufacture of women's hats, the outfitting of which will be second to none other in this country. Let me wish to the JOURNAL and its staff the best of good wishes that go with the season; and let me compliment you on the steadfastness and ability with which you uphold gas as the light of to-day and to-morrow.

MR. W. G. SWENSON and associates, who are, through ownership in the Public Service Company, of Abilene, Tex., in complete control of the gas, electric light and water systems of Abilene, will expend a large sum in construction and reconstruction. The general offices of the Company have been removed to the Sayles Building. This deal was promoted, it is said, by Mr. J. R. Dawson, and the properties were valued by Mr. E. M. Scofield, of Philadelphia.

THE distributing system of the South Delaware Gas Company will be extended from Seaford to South Bethel, under urgent request from the officials and residents of the latter named place.

MR. ROBERT G. GRISWOLD, for some time on the engineering staff of the Denver (Col.) Gas and Electric Company, has been transferred to the New York offices of the H. L. Doherty & Co., syndicate.

THE authorities of Montpelier, O., have been granted to J. H. Kiricafe, of Detroit, Mich., the right to construct and operate an artificial gas plant. The maximum selling rate has been established at $1.50 per 1,000.

THE Common Council, of De Pere, Wis., at a special meeting called for the purpose of considering the matter, granted a franchise to the Green Bay Gas and Electric Company to furnish gas to the named place. The ordinace specifies that the selling rate shall be equal to the rate or rates charged in Green Bay; that the Company shall maintain an office in De Pere; and that it shall file a bond in $10,000 to protect the city against any damages caused by the neglect of the corporation in constructing or maintaining its system.

THE Louisville Gas Company and the Louisville Lighting Companies, as a contribution to the better enjoyment of their employees, gave each of the married members of the force a turkey, the unmarried ones receiving each a $2.50 gold piece.

MR. JAS. W. FLYNN has been appointed Supervisor of Gas Fitting, City Buildings, Dorchester, Mass., and Mr. F. J. Riley has been appointed Inspector of Gas Fitting, same department.

MR. CLIFTON R. HAYES, Resident Manager of the Fitchburg Gas and Electric Light Company, has been elected President of the Fitchburg (Mass.) Board of Trade and Merchants' Association, succeeding the Hon. Frank H. Foss, who declined to accept a re-election.

AT a recent meeting of the Directors of the Hartford City (Conn.) Gas Light Company, Mr. William A. Kneeland, was elected to the office of Assistant Treasurer a position recently vacated. The appointee surely deserved this promotion, for his record with the concern has been lengthy, praiseworthy and successful.

THE "peripatetic expert" yclept William D. Marks has succeeded in getting another job—his luck in this respect so far in 1912 has been rather meager—this time in Spokane Falls, where he will attempt to assist the authorities in battering down the rate the Gas Company may charge. "His fee," says the Spokane *Chronicle*, "will be $50 a day for every day he is engaged on the Spokane case, plus *all* his railroad fare, living expenses and expenses for assistants while working on the case." Think of it! By-the-way "Willie" is putting "C. E." after his name these days. Wonder what the letters stand for in this case. It surely doesn't mean Competent Estimator!

The Market for Gas Securities.

Consolidated moved up 1¼ points in the bid during the week, the opening to-day (Friday) having been reported at 141 to 141¼. The price, of course, is more fanciful than real; but of such is Wall street and its denizens. The feature of the week's news is that the opinion of the Appellate Division, N. Y. Supreme Court, in respect of the right of the New York Mutual Gas Light Company to continue actively in business, under its present franchise, was sustained by the Court of Appeals. The outward signs of the beginning of the end, in respect of consolidating the artificial lighting interests of New York city are increasing. The Company has now at work quite a force of competent men valuing the physical condition of certain plants that are to be completely dismantled.

Brooklyn Union is as it was last Monday, 138 to 142, and a like remark applies to Laclede. Peoples, of Chicago, managed to gain two points. The American Light and Power Company has declared a regular semi-annual dividend of 2½ per cent. on its preferred, payable the 15th prox. The Cincinnati Gas Transportation Company's dividend for the year is 10 per cent., as against 7 per cent. in 1911. At the annual meeting of the Western United Gas and Electric Company these Directors were elected: I. C. Copley, M. W. Stroud, F. Bennet, S. D. Seamon, E. I. Hobbs, W. S. Beanpre, C. E. Colwell, C. C. Smith, T. N. Holden and R. Strohn.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

DECEMBER 30.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$78,177,000	100	141	141¼
Central Union Gas Co.—1st 5's, due 1972, J. & J.	8,000,000	1,000	103	106
Equitable Gas Light Co.—Con. 5's, due 1932, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	8,500,000	100	182	187
New Amsterdam Gas Co.—1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	101	102½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	35	50
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	98½	100½
New York and East River—1st 5's, due 1944, J. & J.	3,500,000	1,000	103	106
Con. 5's, due 1945, J. & J.	1,500,000	—	95	100
Northern Union—1st 5's, due 1927, J. & J.	1,250,000	1,000	99½	101
Standard	5,000,000	100	60	70
Preferred	5,000,000	100	90	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	103	105
The Brooklyn Union	15,000,000	1,000	138	142
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Yonkers	290,650	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	1-1-16	1⅛
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	97	100
Boston United Gas Co.—1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	29,500,000	100	87	90
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90½	91
Preferred	3,026,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	13,460,084	—		—
Mortgages, 5's	3,400,000	—		—
General Mortgage 4½	10,661,000	—		—
Con. Gas Co., Baltimore City, 4½	2,751,000	—		—
Consolidated Gas Co. of N. J.	1,000,000	100	15	—
Con. Mtg. 5's	976,000	1,000	94	96
Bonds	75,000	—	—	100
Detroit City Gas Co.	6,580,000	—	—	50
Essex and Hudson Gas Co.	6,500,000	—	133	136
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,350,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	130	138
" Bonds, 5's	10,500,000	—	104	106
Indianapolis	2,000,000	—	38	45
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	91	95
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	86
Bonds, 1st 5's	3,822,000	1,000	98½	99
Laclede Gas Co., St. Louis	10,000,000	100	102¾	103
Preferred	2,500,006	100	99	102
Bonds	10,000,000	1,000	102¾	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	120	130
Madison Gas and Electric Co. " 1st Mtg. 6's	400,000	1,000	106	
Massachusetts Gas Companies, of Boston	25,000,000	100	91	91¼
Preferred	25,000,000	100	95	95¼
Montreal Gas Co., Canada	2,000,000	100	228	229
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	6,000,000	—	127	128
New Haven Gas Co.	5,000,000	25	182	190
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	114	115
1st Mortgage	20,100,000	1,000	102	102½
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104⅜	105½
Pacific Gas and Electric Co.	15,500,000	—	62	63
St. Joseph Gas Co.—1st Mtg. 5's	1,000,000	1,000	96	98
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	600,000	1,000	113¾	115
General Mortgage, 5's	3,447,000	1,000	94	96
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
Washington (D. C.) Gas Co.	1,600,000	200	427½	430
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	—	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, October 15-17, 1913. Officers: President, W. R. Addicks, New York City. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting Sept. 1913. Officers: President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct. 8, 1913. Officers: President, C. G. M. Thomas, Long Island City, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street. New York City.

Gas Meters.—Next Meeting, January; Chairman, Will W. Barnes; Commissioners, W. H. Pettes, L. W. Peffly; Secretary, H. Thurston Owens, 42 Pine street, New York City. Philadelphia Section; Chairman, L. B. Dutton; Commissioners, S. Grady, H. P. Dains: Secretary, H. F. Patterson, Jr., 831 Chestnut street.

Guild of Gas Managers of New England.—Annual meeting, March, 1913. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, March 19th and 20th, 1913. Chicago, Ills. Officers: President, H. O. Channon, Quincy, Ills.; Secretary-Treasurer, Horace H. Clark, 115 No. Oak Park avenue, Oak Park, Ills.

Illuminating Engineering Society.—Annual meeting,——— September, 1913. Meetings of Sections, monthly. Pres., V. R. Lansingh, Cleveland, O.; Sec., Preston S. Millar, 29 W. 39th street, New York City. Sections: New York, Secretary, C. L. Law, 124 West 42d street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, J. B. Jackson, 28 North Market street. Pittsburgh, Secretary, J. C. Mundo, Oliver Building.

Indiana Gas Association.—Annual meeting, March 12 and 13, 1913. Indianapolis. Officers: President, Howard L. Olds, Indianapolis; Vice-President, Wm. Wallace, Lafayette; Secretary-Treasurer, Philmer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, May 22, 23 24, 1913; Burlington, Ia. Officers: President, C. W. Fair, Atlantic, Ia.: Secretary, G. 1. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, October——1913. ——— Officers: President, L. O. Ripley, Emporia, Kas.; Secretary and Treasurer, W. H. Fellows, Leavenworth, Kas.

Michigan Gas Association—Annual meeting, September——1913; ——— Officers: President, W. S. Blauvelt, Detroit, Mic.: Secretary-Treasurer, Glenn B. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1913; Mexico, Mo. Officers: President, P. A. Bertrand, Joplin, Mo.; Secretary and Treasurer, P. W. Markham, Brookfield, Mo.

National Commercial Gas Association.—Annual meeting———1913. Philadelphia, Pa. Officers: President, C. W. Hare, Philadelphia Pa.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, Cleveland, O., May 20-22, 1913; Officers: President, M. B. Daly, Cleveland, O; Secretary, T. C. Jones, Delaware, O.

New England Gas Association.—Annual meeting, February, 19th and 20th. 1913 Boston. Officers: President, D. D. Barnum, Worcester, Mass.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—Annual Meeting, April —, 1913, ——— N. J.—President, William H. Pettes, Newark, N. J.; Secretary-Treasurer, Arthur H. Osborn Belmar, N. J.

Ohio Gas Association.—Annual meeting, February ———, 1913, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, L. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—Annual meeting, Oklahoma City May, ——1913. President, F. W. Caldwell, Shawnee, Okla.; Secretary, H. V. Bozell, Norman, Okla.

Pacific Coast Gas Association.—Annual meeting, San Jose, Cal., September 16, 17, 18, 1913. Officers: President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, Henry Bostwick, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, York, Pa., April 9-11, 1913; Officers, President, H. H. Ganser, Norristown, Pa.; Secretary-Treasurer, W. O. Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting Dec., 11, 1913; monthly meetings, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city

Southern Gas Association.—Annual meeting, Charlotte, N. C., April 18-20, 1913, Officers: President, C. E. White, Montgomery, Ala.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. May 21, 22, 23 and 24, 1913, Galveston, Tex. Officers: President, F. M. Lege, Jr., Galveston, Tex.; Secretary H. S. Cooper, 405 Slaughter Bldg., Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May 14 and 15, 1913, Milwaukee, Wis. Officers: President, I. F. Wortendyke, Janesville, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.

FOR SALE

on
the

PREMISES

of
the

MANUFACTURERS,

OXIDE,---- PAINT,

BY **BY**

CONSOLIDATED GAS PURIFICATION AND CHEMICAL CO.,
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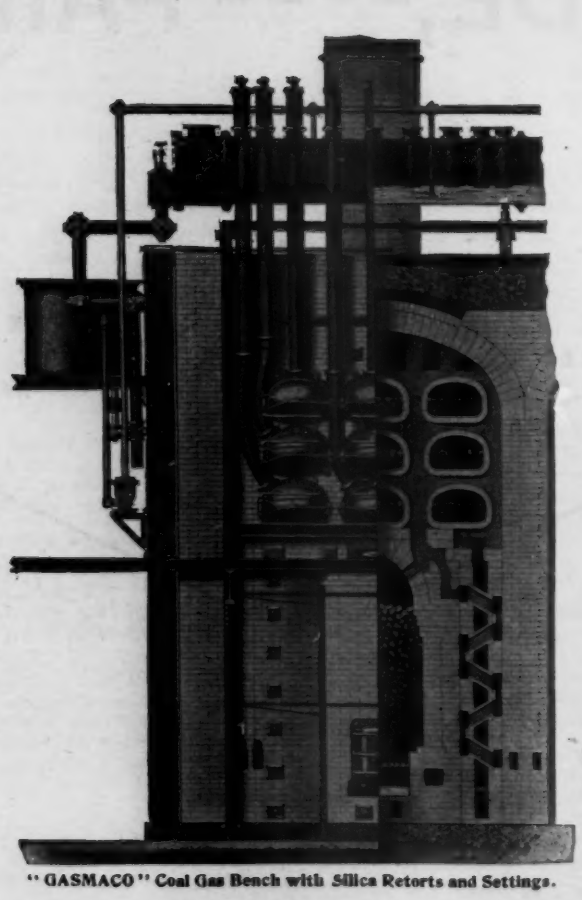

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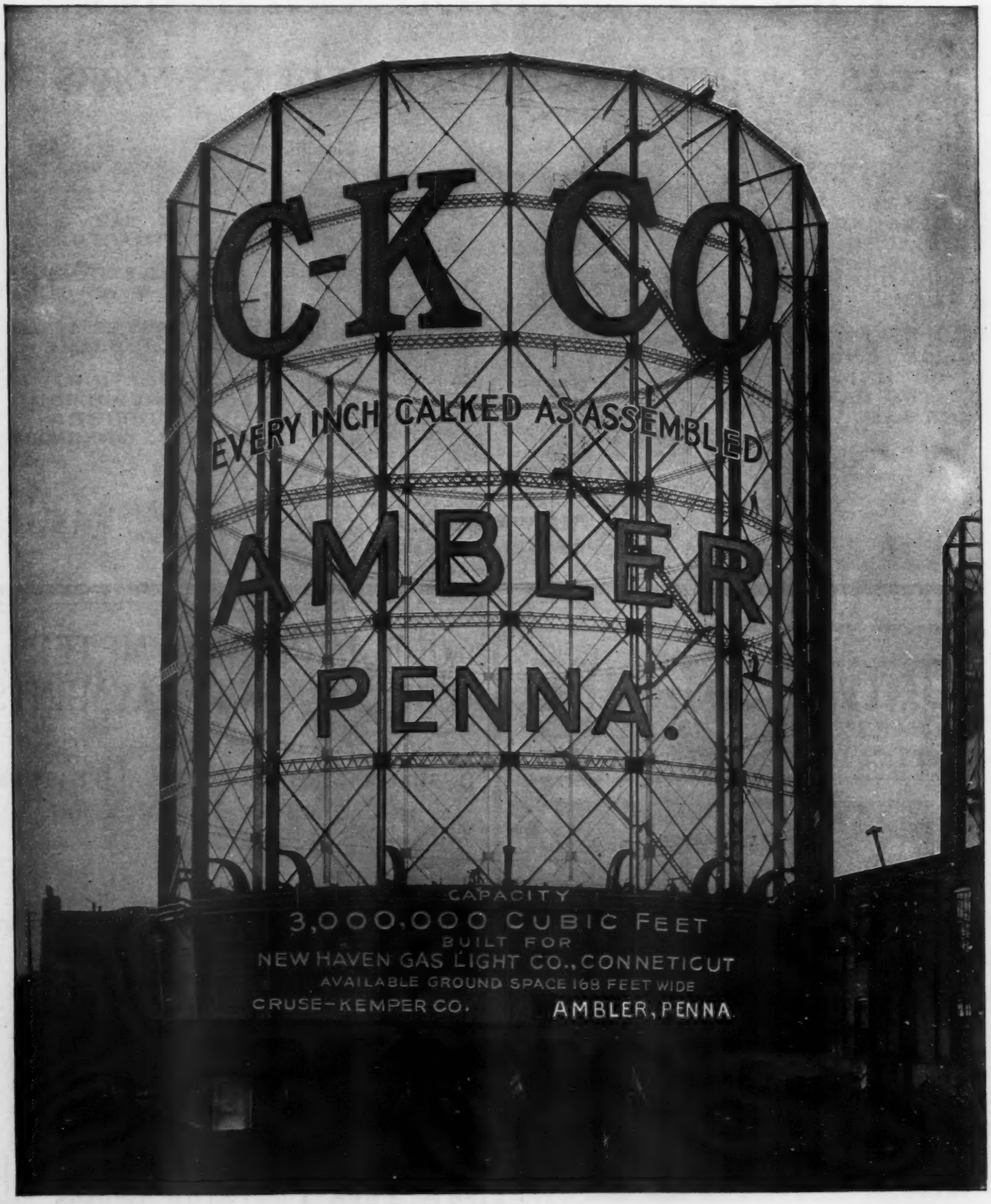
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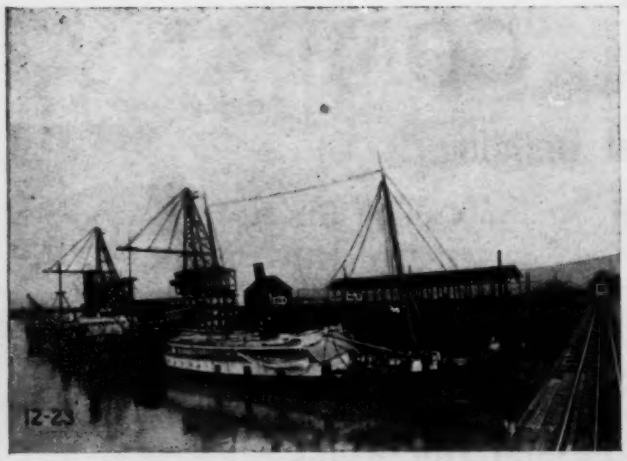

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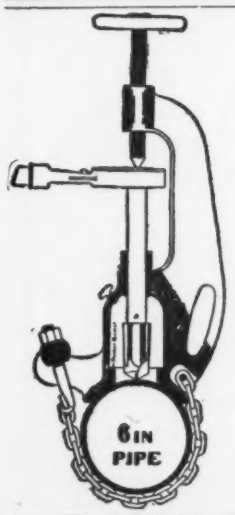

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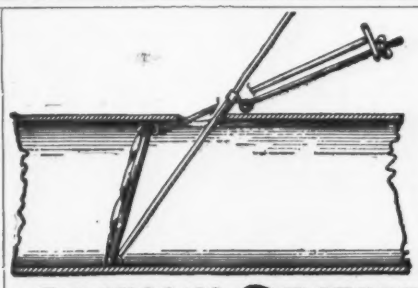

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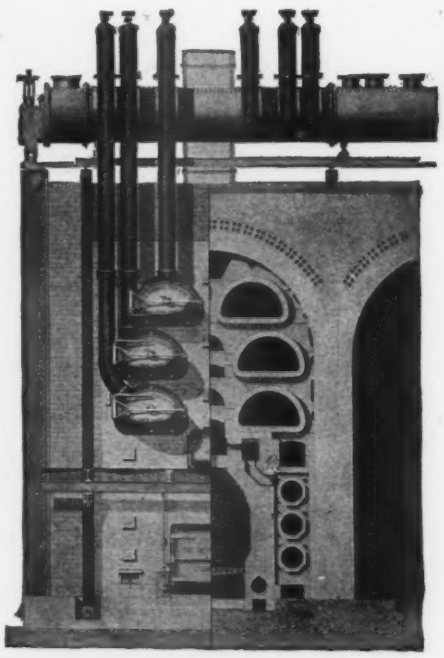

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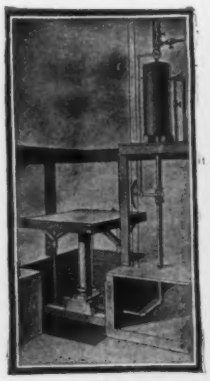

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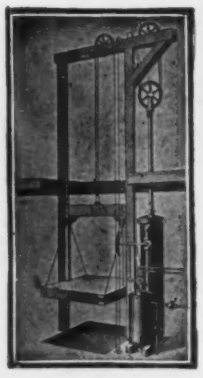

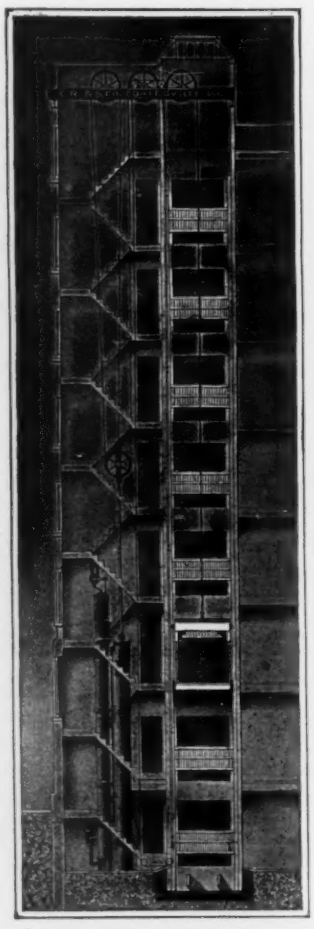

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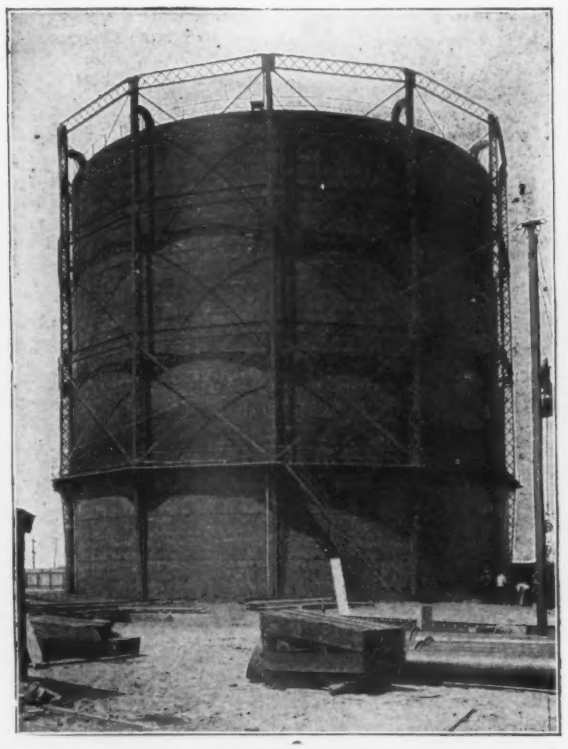

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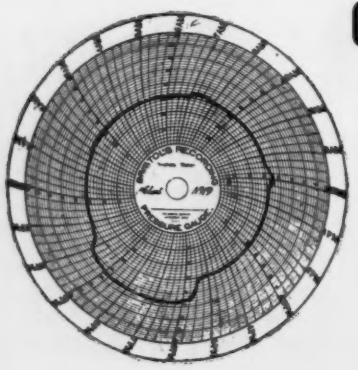

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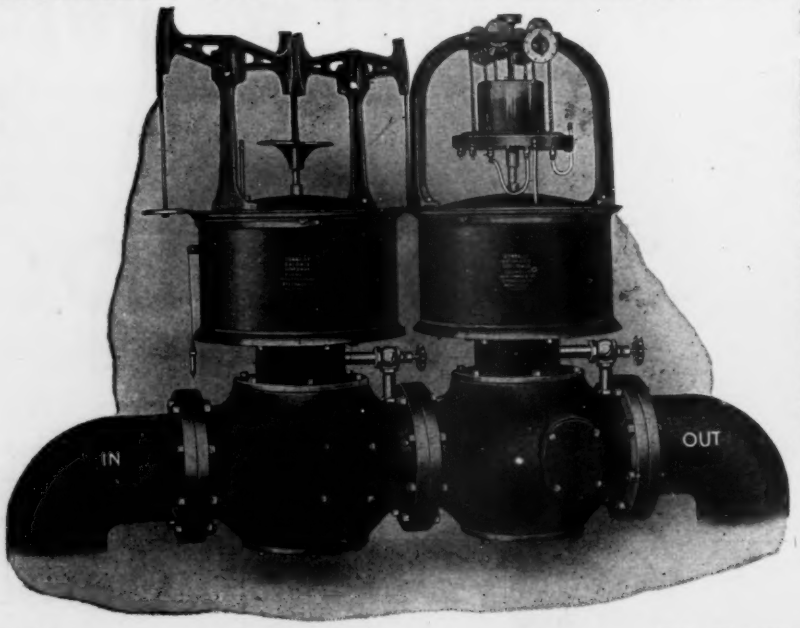

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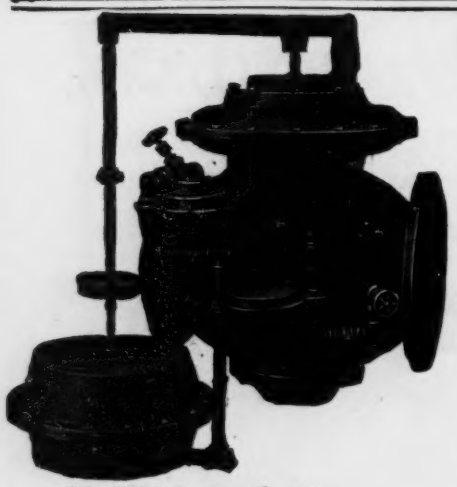

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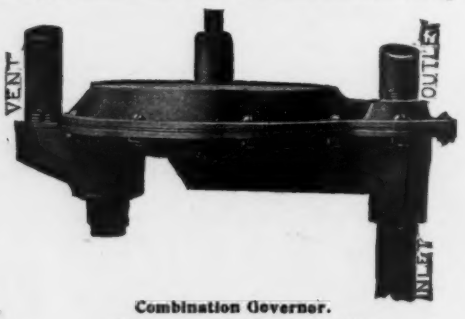

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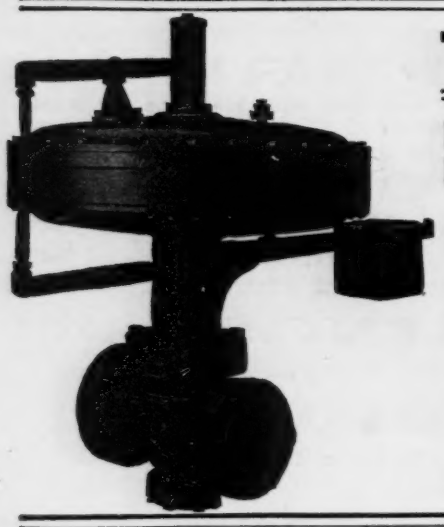

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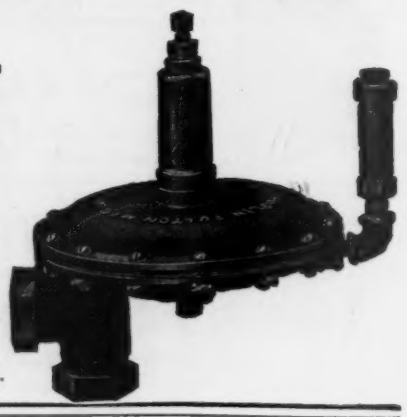

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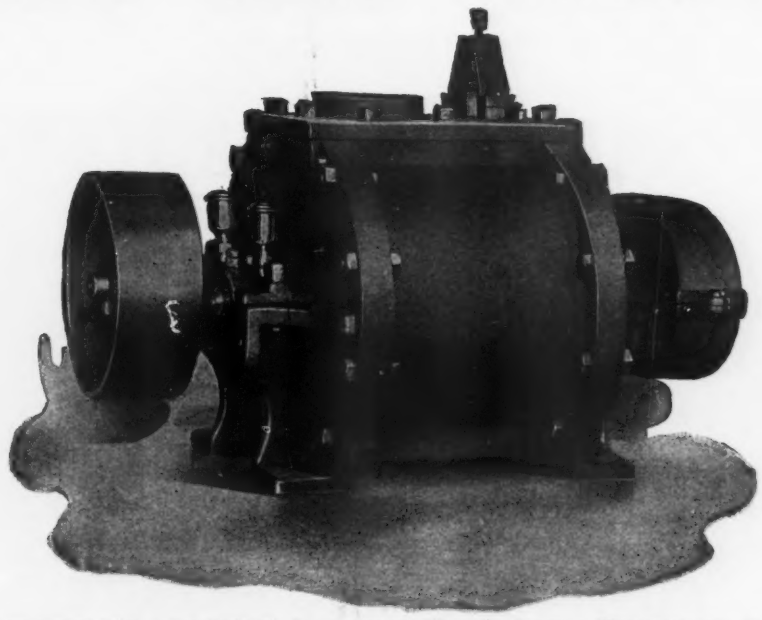

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OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, June 12, 1912.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable July 15, 1912, to stockholders of record at the close of business, June 29, 1912. Checks will be mailed.

1932-4 LEWIS LILLIE, Treasurer.

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By a practical gas man, with 16 years' experience, and not afraid to work. Can show and get results. Getting new business a specialty.

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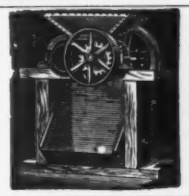

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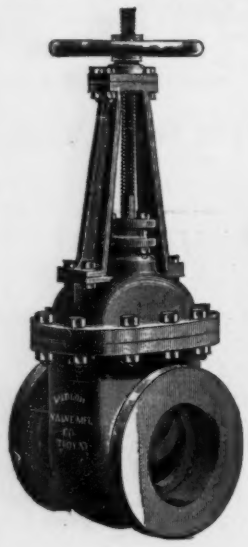

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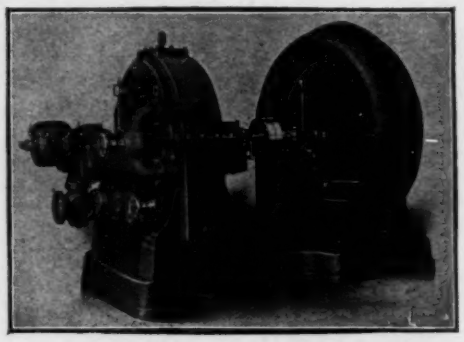

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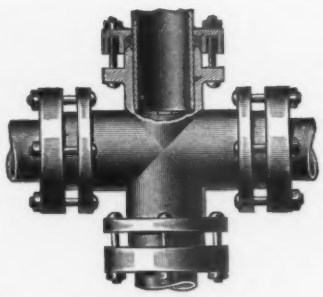
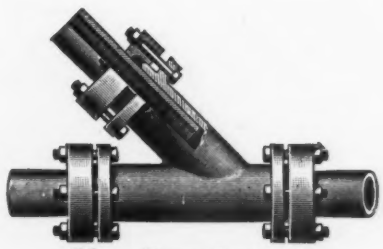


Crosses.
Style 17.



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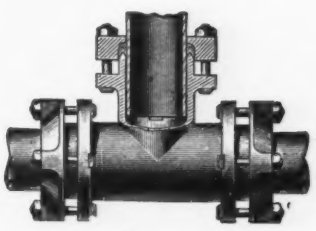

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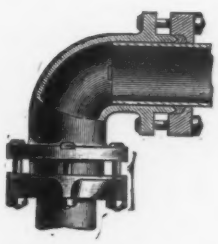

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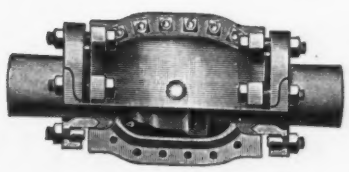

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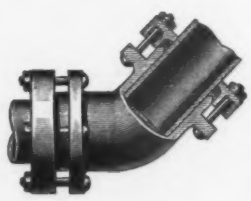

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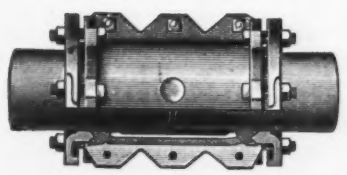

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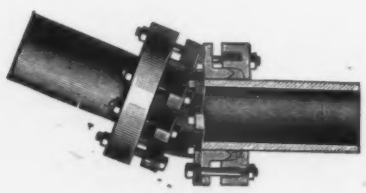

Angle Couplings.
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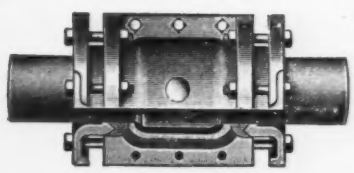

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U. S. A.

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Gas Machinery Co.
Michigan Ammonia Works.
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Conveyors,
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Castings.
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Coke Crushers.
Bartlett-Hayward Co.
Keller, C. M.

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Griffin & Co., John J.
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Keystone Meter Co.
McDonald & Co., D.
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Meters—Proportional.
Metric Metal Works.
Pittsburg Meter Co.
Rotary Meter Co.

Meter Provers.
See Provers.

Meters—Regular.
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Dickey & Co., C. H.
Griffin & Co., John J.
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Standard Meter Co.
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Sprague Meter Co.
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Dickey & Co., C. H.
Equitable Meter Co.
Griffin & Co., John J.
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McDonald & Co., D.
Rotary Meter Co.
Standard Meter Co.
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Meters—Steam.
Gas Machinery Co.
United Gas Improvement Co.
Western Gas Construction Co.

Meters—Test.
American Meter Co.
Dickey & Co., C. H.
Pittsburg Meter Co.
Standard Meter Co.

Meters—Wet.
American Meter Co.
Helme & McIlhenny.
Pittsburgh Meter Co.
Tufts Meter Co., N.

Oil Tanks.
See Holders.

Outdoor Lighting Fixtures.
See Street Lamps.
Lamp Posts.

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Dixon Crucible Co., Jos.

Photometers.
American Meter Co.
Connelly Iron, Sponge and Governor Co.
Precision Instrument Co.—Jet and Bar.

Plants—Complete.
See Engineers—Contracting.

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Davis & Farnum Mfg. Co.
Dresser Mfg. Co., S. R.
Donaldson Iron Co.
Kerr Murray Mfg. Co.
Quintard Iron Works.
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See Coal Gas Apparatus.
Water Gas Apparatus.
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Isbell-Porter Co.
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PUBLIC LIGHTING TABLE FOR JULY, 1912.

[COMMUNICATED BY THE AMERICAN METER COMPANY.]

Day of Week.	MOONLIGHT SCHEDULE.		
	Date.	Light.	Extinguish.
Monday	1	8.00 P.M.	10.30 P.M.
Tuesday	2	8.00	11.00
Wednesday	3	8.00	11.20
Thursday	4	8.00	11.40
Friday	5	8.00	12.00
Saturday	6	8.00	12.30 A.M.
Sunday	7	8.00 L.Q.	12.50
Monday	8	8.00	1.10
Tuesday	9	8.00	1.40
Wednesday	10	8.00	3.40
Thursday	11	8.00	3.40
Friday	12	8.00	3.40
Saturday	13	8.00 N.M.	3.40
Sunday	14	8.00	3.40
Monday	15	8.00	3.40
Tuesday	16	8.00	3.40
Wednesday	17	8.00	3.40
Thursday	18	9.20	3.40
Friday	19	9.40	3.40
Saturday	20	10.00 F.Q.	3.40
Sunday	21	10.30	3.50
Monday	22	11.00	3.50
Tuesday	23	11.30	3.50
Wednesday	24	12.10 A.M.	3.50
Thursday	25	1.00	3.50
Friday	26	2.00	3.50
Saturday	27	No L.	No L.
Sunday	28	No L. F.M.	No L.
Monday	29	No L.	No L.
Tuesday	30	7.50 P.M.	9.30 P.M.
Wednesday	31	7.50	9.50

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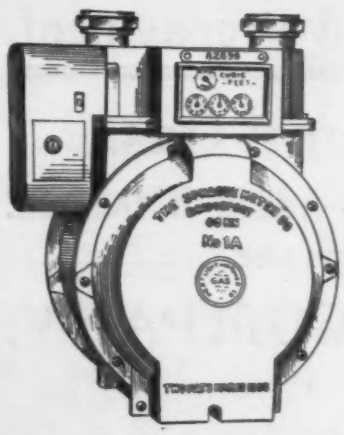

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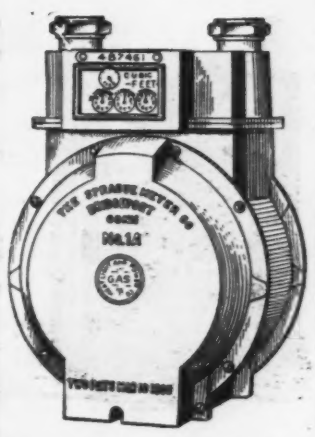

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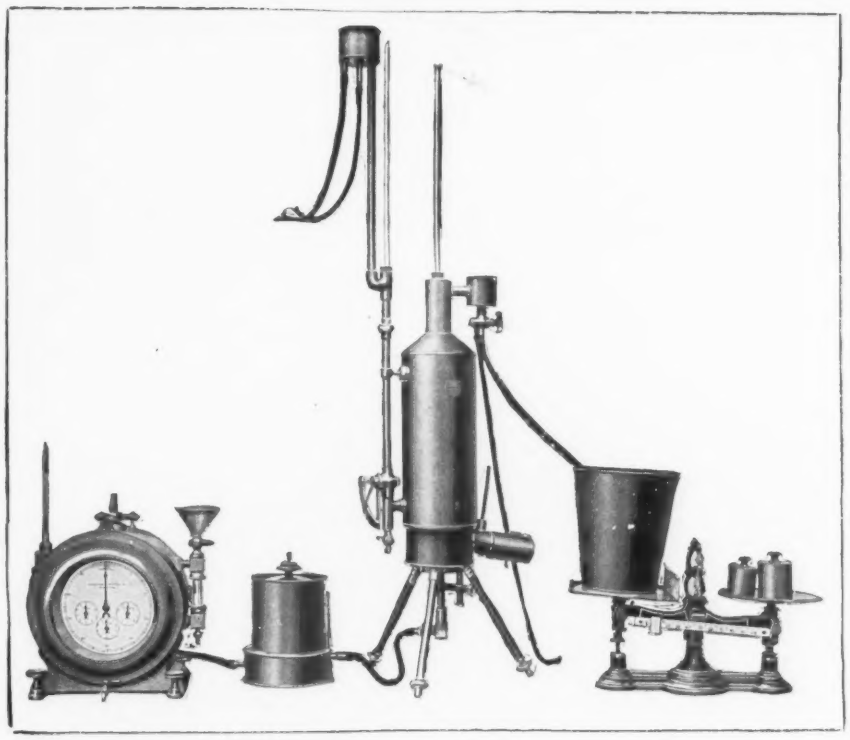

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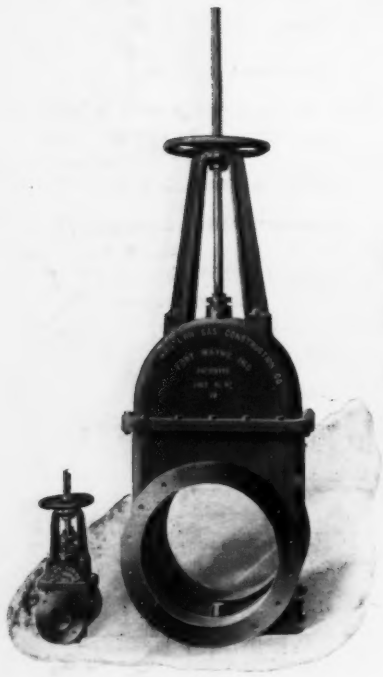

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